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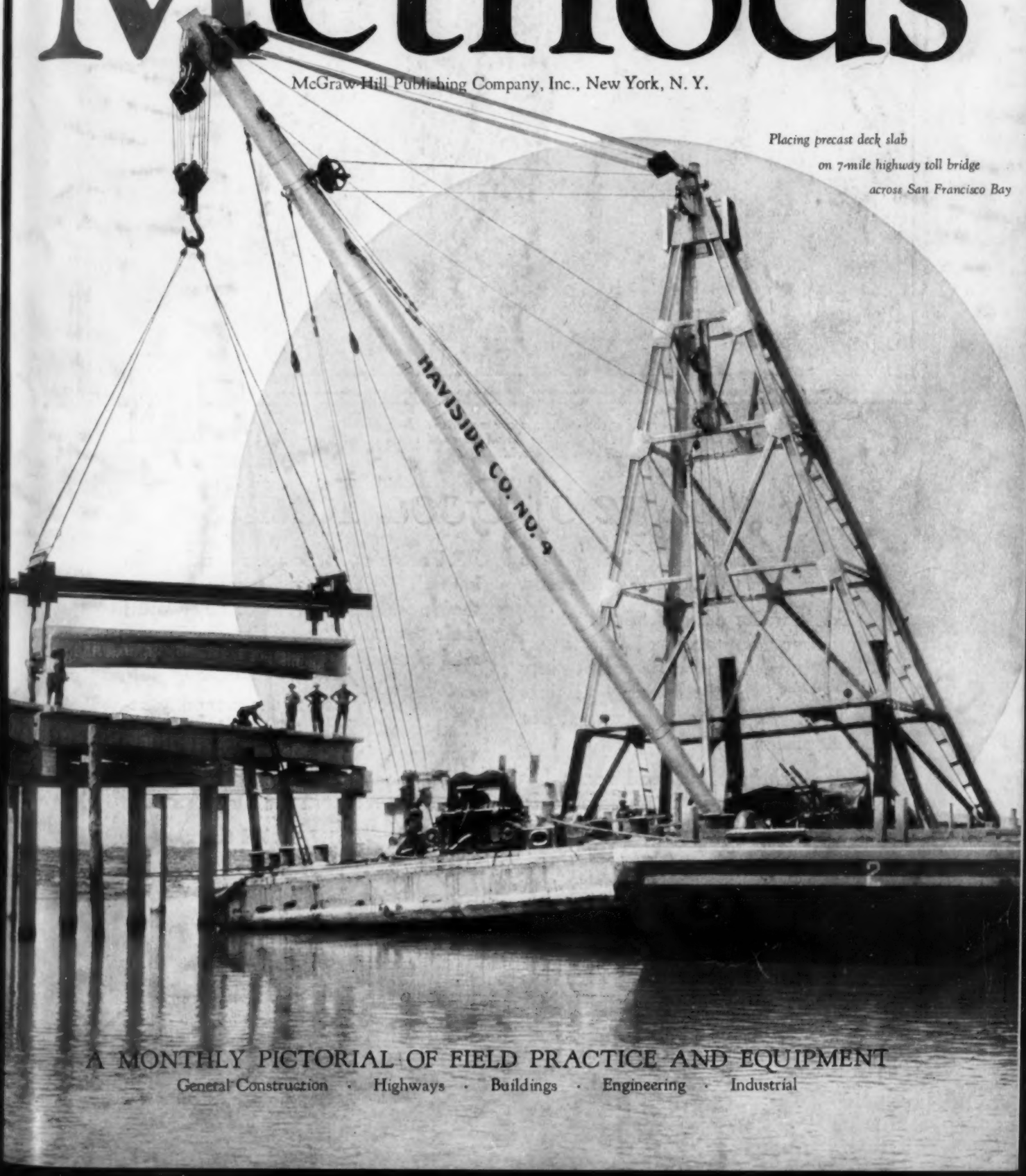
Construction Methods

April 1929

McGraw-Hill Publishing Company, Inc., New York, N. Y.



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TECHNOLOGY DEPT.

For Better Road Building

NEW YORK road builders, assembled in the third annual meeting of the New York State Highway Chapter of the Associated General Contractors, last month, recorded substantial progress in placing the industry on a firm business basis.

Among important actions taken was the establishment by equipment manufacturers and distributors within the state of an affiliated bureau, pledged to correct past abuses in extending unduly long credit terms. In the past it has been far too easy for any one appropriating the title of "contractor" to secure, on a financial shoe-string, equipment and materials for a job which he is entirely unqualified to perform.

THE CHAPTER is carrying on a campaign to require prequalification of bidders on public works contracts. A bill covering this matter, now pending in the New York Legislature, should be enacted. It will accomplish great good by weeding out of the industry the irresponsible contractors who have been a thorn in the side of the industry for years past. It will aid public officials, too, by enabling them to award work to the lowest *responsible* bidder.

MECHANICAL, instead of hand-finishing for concrete pavement slabs, is made obligatory in the revised New York State highway specifications for the current year.

CURING of concrete pavement by covering with hay and sprinkling with water gives rise to more bickering between engineer and contractor than almost any other construction operation. The remedy may lie in the substitution of asphaltic emulsions or of chemical solutions to take care of the curing process—and do the job at a lower cost. Attention was called to the attractive possibilities of a substitute for water curing at the New York highway contractors' meeting last month by Charles R. Waters, district engineer, State Highway Department.

HERE'S ANOTHER practical point brought out at the meeting: The use of the so-called quick-setting cements generates more heat, in the hardening process, than do ordinary cements. Contractors will do well, therefore, to pay extra attention to the curing process, for more water than the amount ordinarily used is required to secure best results.

AMONG THE most immediate needs in concrete paving equipment today, declared an experienced road builder, is an accurate water measuring device on the mixer.

ONE OF THE accomplishments of the New York State Highway Chapter, working in co-operation with the State Highway Department, involves the matter of payment on monthly estimates. A change has been made in the rules so that now a contractor may be paid semi-monthly, provided the value of his work done during the period exceeds $30,000. Formerly payments were made only at intervals of a month. The new rule will strengthen the contractor's financial status by getting into his hands promptly the money that is due him.

SERVICE AND REPEAT ORDERS—One of the biggest assets any contractor can possess is an organization of loyal, skilled workers. Length of service by the key men of a construction company is a pretty fair indication of the morale of the personnel. That is why particular significance attaches to a recent statement by Henry C. Turner, president of the Turner Construction Co. The company's service records show that its chief executives have averaged 23 years with the organization; office staff and superintendents, 14 years; and foremen 15 years.

Incidentally, 54 per cent of all the company's construction work represents repeat orders from clients who apparently feel that their work was well handled. It is within the bounds of probability to assume that there may be a connection between the two conditions cited.

OBSOLESCENCE — Our industrial supremacy has to a large extent depended upon our ability to inspire change, according to Charles F. Abbott, executive director of the American Institute of Steel Construction. In the future, he believes, our prosperity will depend upon our ability to create millions of buyers who will recognize obsolescence as a sound basis for their purchasing. Obsolescence does not imply waste. For the contractor it means the scrapping of old machinery, old methods and old ideas and their replacement with what is newer and better. The organizations with modern equipment are the ones that are making the profits. To the principle of creative spending should be coupled that of creative wasting—discarding and replacing the obsolete.

CONSTRUCTION METHODS
A monthly review of modern construction practice and equipment

PUBLISHED BY
McGRAW-HILL PUBLISHING COMPANY, INC.
TENTH AVENUE AT 36TH ST., NEW YORK

Over and Over Again

FIRST a big idea—born in the field, the shop or the laboratory; rich in possibilities of service to an industry.

Then the nourishing hand of a manufacturer who believes in the idea and is willing to stake his resources to back his faith. And in due course the press of an industry broadcasts the news of a new product that will speed production, reduce costs or better quality.

And then—what?

Some will read the news. Others will hear of it. A few will "try out" the new thing. But after all they will be but few, and the "big idea" cannot yet do a job in keeping with its promise.

Then comes education. Over and over and over again the manufacturer must tell the industry what he has to offer in terms of better, quicker or cheaper production.

There is no short-cut. Each week, each month, each year, more of those who need his service will see, read and heed—will unload a part of their burdens upon the back of the "big idea."

And so, in time, an industry is educated to accept the new product as a necessity, and eventually the "big idea" is enabled to make its destined contribution to progress.

An essential part in the educational program must be taken by advertising. That is why the advertising pages of industrial journals such as *Construction Methods* are so vital a part of the service rendered by the journal to its industry.

They are helping to turn "big ideas" into practical tools and to educate an industry to their intelligent use, thereby making for greater productivity and for higher standards of living for every man in the industry.

Willard Chevalier

Publishing Director

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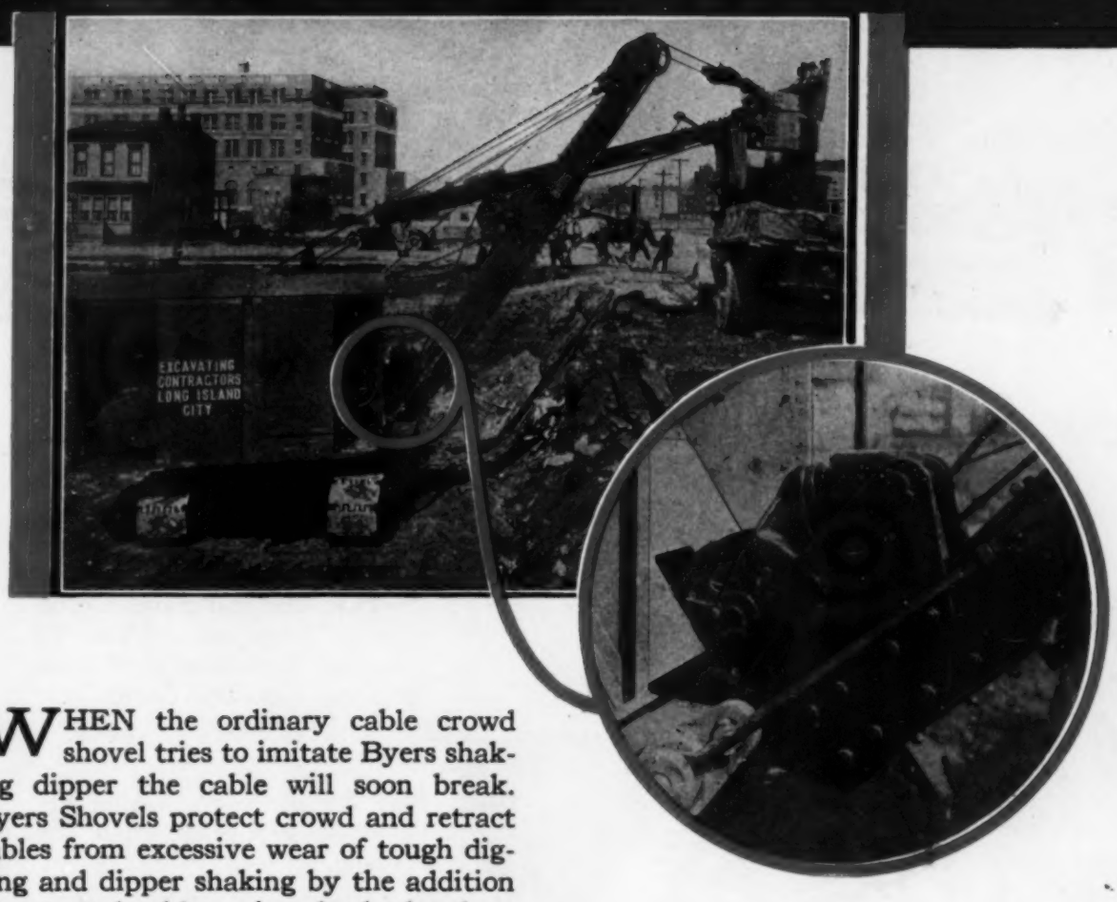

WHEN the ordinary cable crowd shovel tries to imitate Byers shaking dipper the cable will soon break. Byers Shovels protect crowd and retract cables from excessive wear of tough digging and dipper shaking by the addition of patented cable saving shock absorbers —a feature that pays for itself over and over again and is found on Byers only.

This exclusive Byers feature cuts the month's cable maintenance bill, reduces loss of time by eliminating frequent cable changes, and allows the special independent crowd to continue to empty the dipper of sticky materials by this fastest of all methods.

The Byers Crowd is known for emptying the dipper quickly and Byers shock absorbers for increasing the life of cables.

These features are found in Byers Master and Byers Bulldog shovel catalogs. Write for them today.

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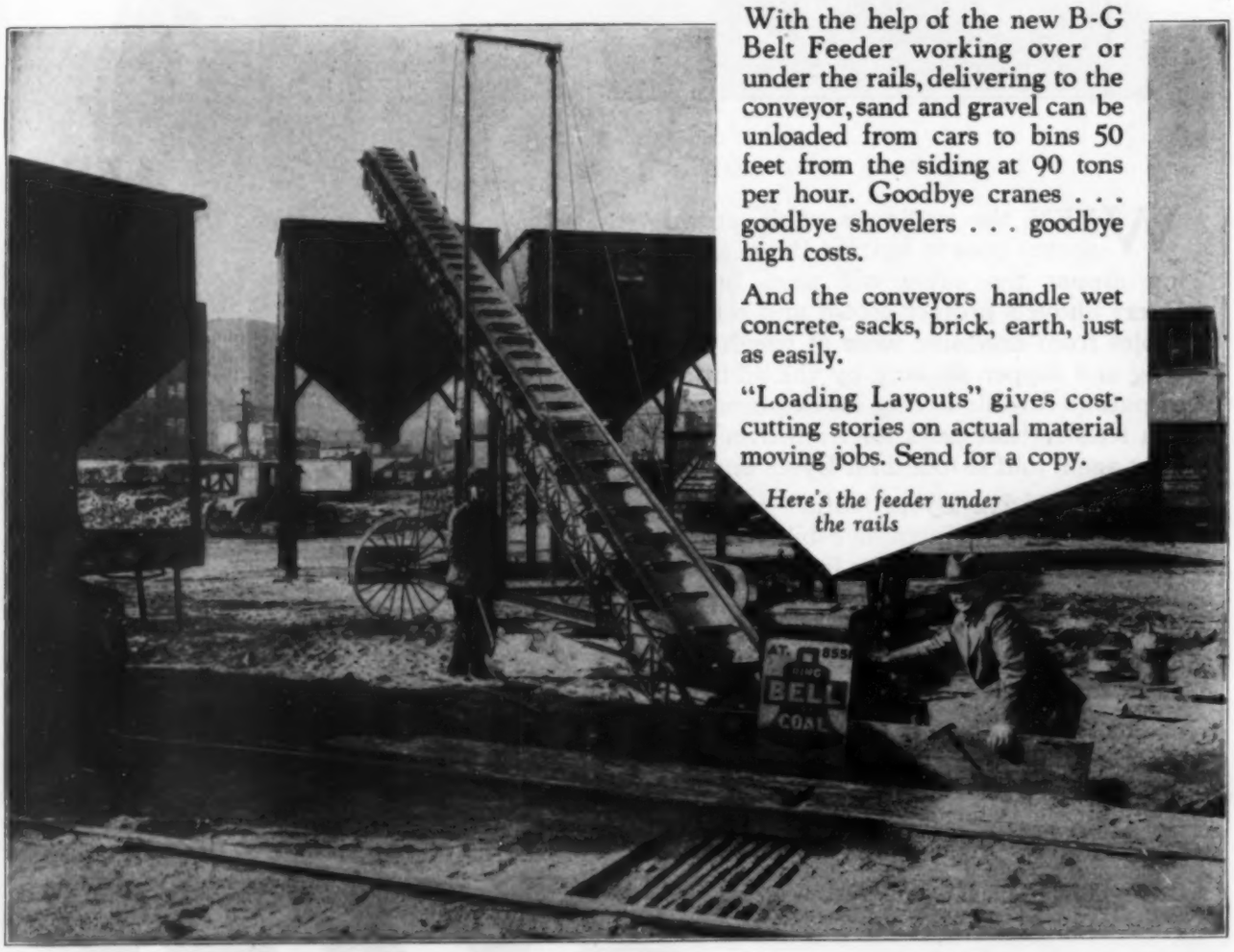

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At the touch of a finger you get the full capacity of your machine.

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"INCOR" Cement was used for the arch-ring keystones of Arlington Memorial Bridge to solve an interesting engineering problem.

The KEYSTONES *of a Nation's Memorial*

BESIDES its unique advantage of producing *permanent Portland Cement concrete* ready for use in 24 hours, the high-early-strength of "INCOR" Cement is a key that unlocks many difficult construction problems. The new Arlington Memorial Bridge is a case in point:

The forms of the arches of this new structure rest on steel supports, which contract when the temperature drops. If the weight of an arch were suddenly thrown on a freshly placed arch-ring keystone of ordinary concrete, the result might prove disastrous.

"INCOR" concrete for these arch-ring keystones solved the problem by quickly providing strength more than ample to support the weight of the arches even under these extreme conditions.

"INCOR" Brand Perfected High-Early-Strength Portland Cement, produces *permanent, dependable concrete* that is ready to use in 24 hours. Wherever time is a governing factor in solving an engineering problem, it pays to use "INCOR".

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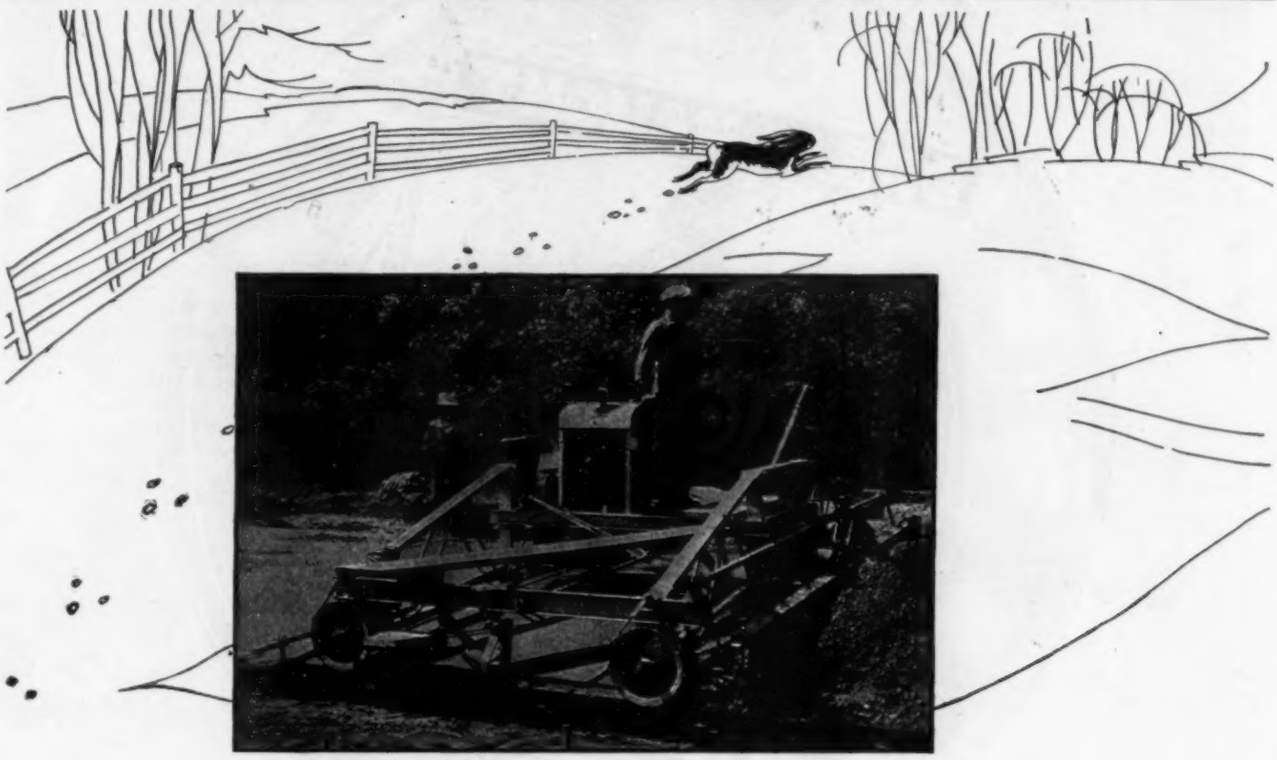

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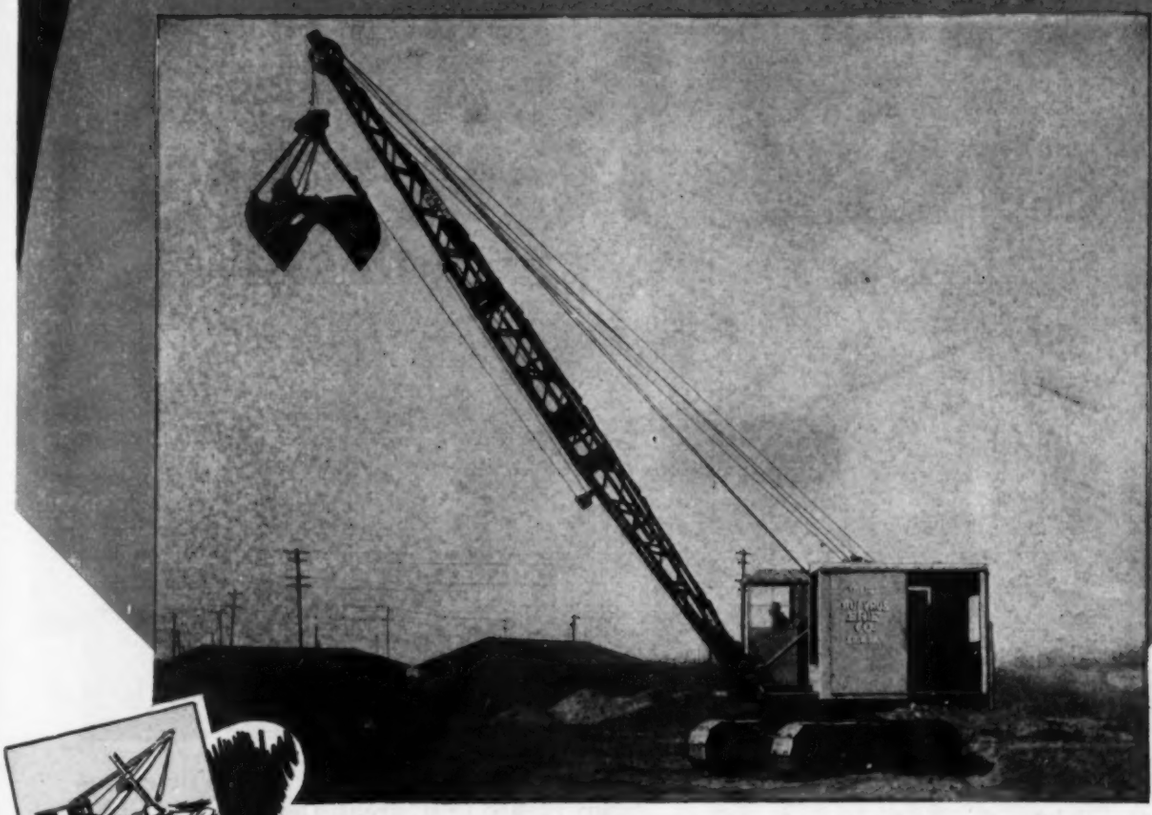

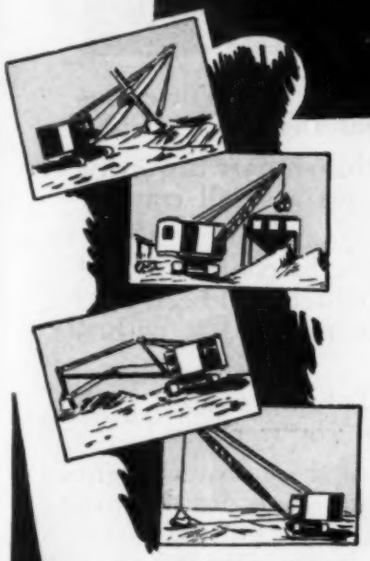

Easily convertible — clamshell, shovel, dragline or drag-shovel. Easily changed over for any of these classes of work. Or can be converted to electric power when desired.

With *one-piece truck frame and turntable* instead of structural steel— with gears enclosed and running in oil— with anti-friction bearings— and many other improvements that mean *better value*.

Now you can get a ½-yard gasoline machine that can safely be used miles away from any repair shop— a ½-yard machine that is built to stand up.

Built for service: See this machine and compare its construction. Check the diameters of important shafts, and the sizes of bearings. Note how all parts subject to wear are small and inexpensive, interchangeable and easy to replace.

You get this sturdier construction in the BUCYRUS-ERIE "1020" because BUCYRUS-ERIE Company has the confidence in this machine— and the resources— to invest in the necessary patterns and machines. . *It pays the user!*

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The complete plant has been moved 100 feet in 15 minutes! Portability!

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Two other features are found only in Ransome Towers.

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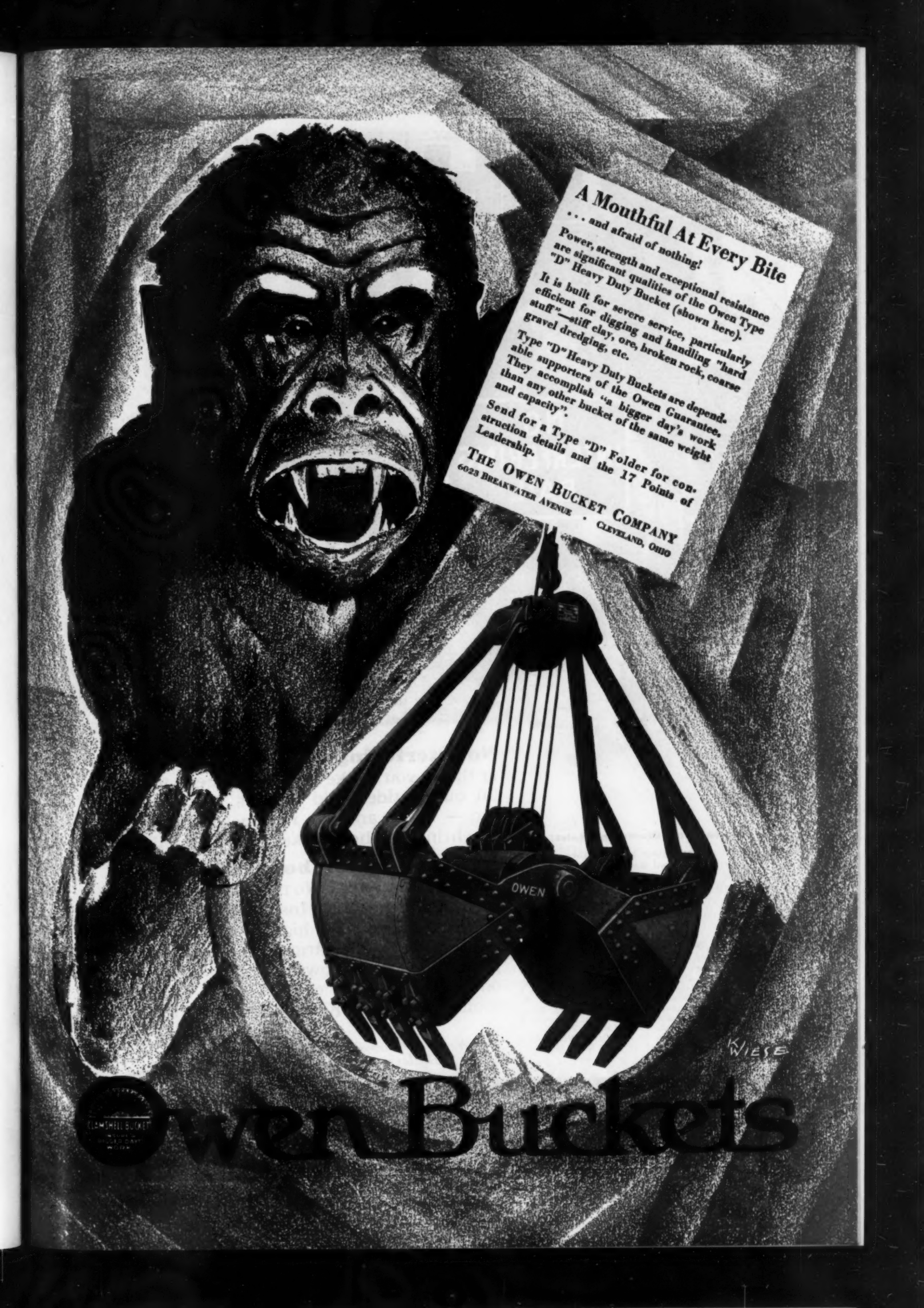
A Mouthful At Every Bite
. . . and afraid of nothing!
Power, strength and exceptional resistance are significant qualities of the Owen Type "D" Heavy Duty Bucket (shown here).
It is built for severe service, particularly efficient for digging and handling "hard stuff"—stiff clay, ore, broken rock, coarse gravel dredging, etc.
Type "D" Heavy Duty Buckets are dependable supporters of the Owen Guarantee. They accomplish "a bigger day's work than any other bucket of the same weight and capacity".
Send for a Type "D" Folder for construction details and the 17 Points of Leadership.
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No interfering bail—that's another thing you'll like when you need to lift out boulders, old timbers, stumps, etc. — that's another reason why the Koehring is the all-service shovel!

Raise or lower boom at command of levers! No need for adjusting crowding cables! Instant readiness for any situation — high bank work, close-in digging — stripping — shallow grading — high or low dumping! Fast on its feet and as easy steering as a motor truck! . . . Know the Koehring!

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Put all the power behind either — use both—crowd the dipper "home" and with all power behind the hoist, heap the dipper! . . . *Again we say, "Know the Koehring!"*

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—But there are good reasons why this wire rope is able to give such exceptional results, some of which are:

(1) It is made of acid open-hearth steel wire.

(2) Every wire put into this rope is first rigidly tested by us to make sure that it meets our exacting requirements.

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If you are not entirely satisfied with your wire rope results; if you want to minimize the time your equipment is idle due to rope changes; if you want maximum wire rope service for each wire rope dollar that you spend, we would like to have you give "HERCULES" a chance to show you what it can do.

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Cletracs are built in a complete line to meet every need of highway and contracting service

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HEAVY spring work and a big schedule ahead! This condition always emphasizes the "shortcomings" in equipment — *particularly tractors.* Are they adequate and dependable — capable of doing the tasks that summer time is bringing?

Right now hundreds of contractors, highway engineers and officials are making up their minds about Cletrac — and their orders are saying, "DELIVER AT ONCE." *Now is the time to buy* — at the start of the season. And whether it is for road work, excavating, grading, earth-moving, or any other jobs that call for abundant and reliable power, you will find Cletrac a thoroughly profitable investment.

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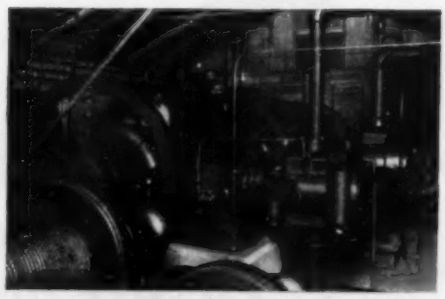
All voted for the same tool. The superintendent scraped off the clay and recorded the name, "SULLIVAN." One week of testing, and the contractors standardized on Sullivan Spaders.

Sullivan Spaders are hard on clay, but easy on men. They are balanced, smooth-running, and powerful. Your men will like them, too.

Send for Catalog 7281-N

The "DH-361" Spader is part of the complete new Sullivan Line of Drills. New Sullivan Hammer Drills, Drifters, Sinkers, and Concrete Breakers are making records, too. *Send for the Catalogs.*



Sullivan Compressors run the Spaders at Maumee

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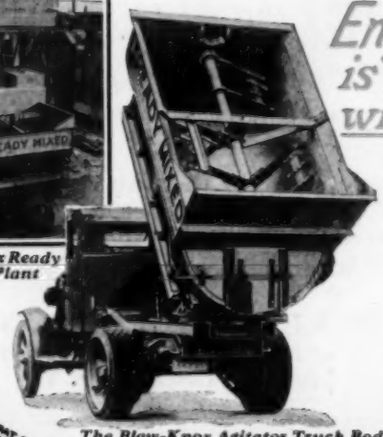
Most carefully prepared for

A typical Blaw-Knox Ready Mixed Concrete Plant



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A compilation of facts and figures gathered from Ready Mixed Concrete Plants throughout the United States . . . prepared by engineers who know the Ready Mixed Concrete business from start to finish.

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TRADE MARK REG. U.S. PAT. OFFICE
BLAW-KNOX

BLAW-KNOX

CHAIN . . .

"If it isn't branded C-M, it isn't INSWELL"

THERE is an extra flash of reinforcing material on every link of "Inswell" chain . . . an extra muscle of steel that strengthens the weld.

This means a chain that lasts longer and that reduces chain costs for customers. Every link of this famous INSWELL CHAIN is now branded with the initials C-M by this Company. With this distinguishing mark it is easy for your customers to identify the real "INSWELL" chain, easy for them to reorder.

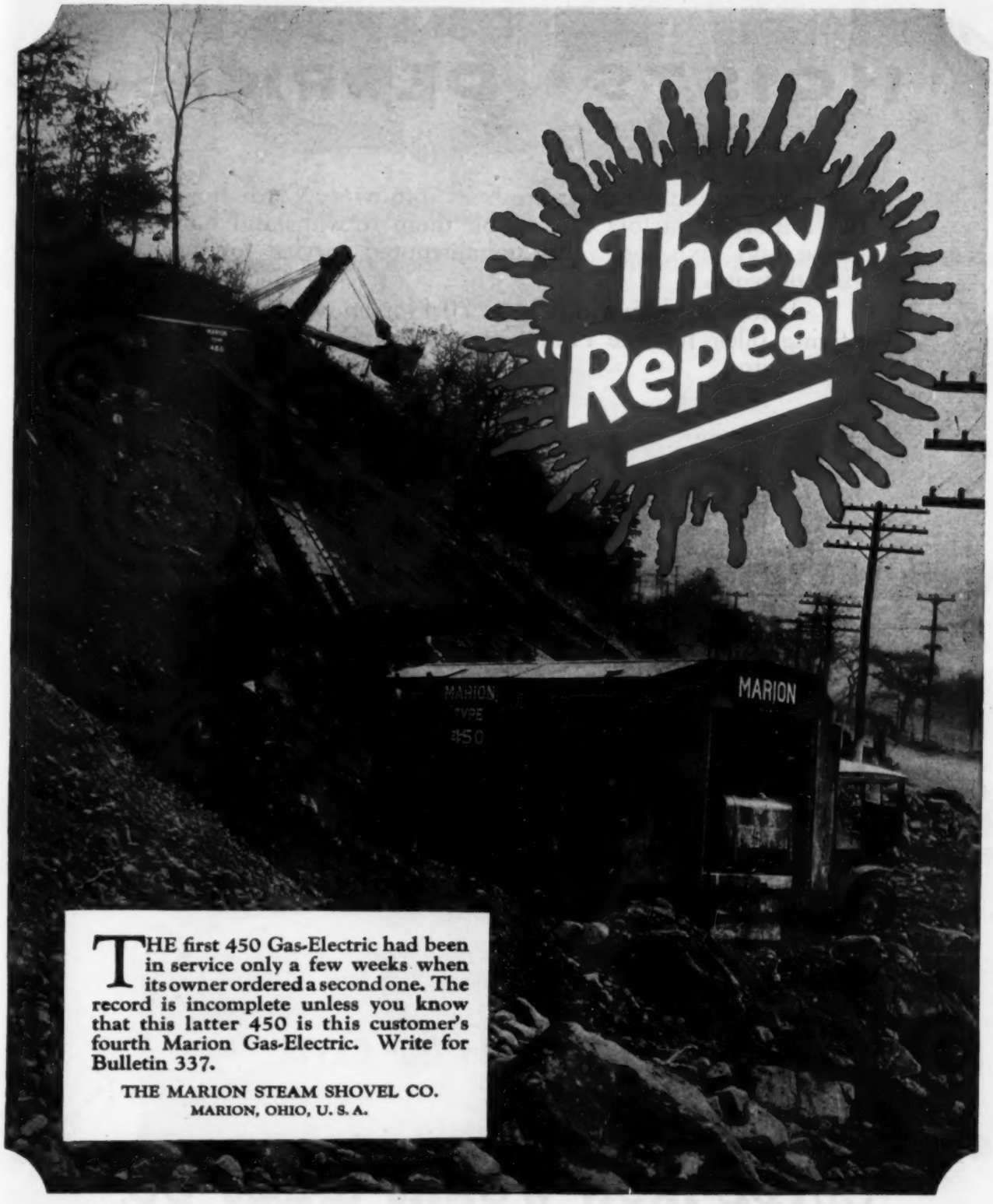
There are chains—and chains, but only one INSWELL. Remember; C-M when buying your chain.

COLUMBUS McKINNON CHAIN COMPANY

Also manufacturers of the famous Dreadnaught Tire Chains

General Sales Offices: Tonawanda, N. Y.
Plants: Tonawanda, N. Y., Columbus, Ohio
In Canada: McKinnon Columbus Chain, Ltd., St. Catharines, Ontario

"INSWELL" ELECTRIC WELD CHAIN



THE first 450 Gas-Electric had been in service only a few weeks when its owner ordered a second one. The record is incomplete unless you know that this latter 450 is this customer's fourth Marion Gas-Electric. Write for Bulletin 337.

THE MARION STEAM SHOVEL CO.
MARION, OHIO, U. S. A.

MARION

29888

CLYDE HOISTS-DERRICKS

Strength and power are built into every Clyde hoist, two important factors that enable them to withstand hard usage and give long and uninterrupted service for any kind of work.

Below is shown a Clyde 70 Horsepower gas hoist driving piles for the Hart Construction Co. at Tacoma, Washington.

Put a Clyde on your next job.

CLYDE

CLYDE IRON WORKS SALES CO.

DISTRIBUTORS FOR CLYDE IRON WORKS DULUTH, MINNESOTA

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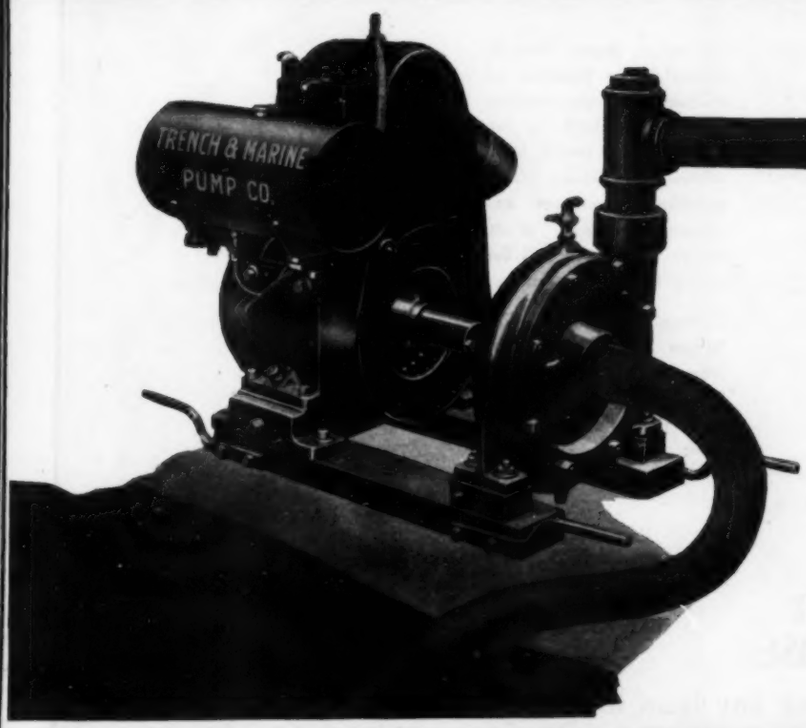
CLYDE TWO MARKS OF GUARANTEED QUALITY

SUCCESSFUL PERFORMANCE FOR AGC-A.G.C.

TRENCHMARINE
Portable Pumps



Dirty Water Cannot Clog These Pumps

For pumping clean or dirty water from trenches, sewers, cellars, quarries, reservoirs, barges, ships and cesspools.

WHY "TRENCHMARINE" PUMPS?

1. Capacities up to 8400 GALLON PER HOUR.
2. Air-cooled—WILL NOT FREEZE in winter nor HEAT UP IN HOT WEATHER.
3. Compact and light—EASILY TRANSPORTED.
4. Four cycle engine—high tension magneto.
5. Open impeller pump—CANNOT CLOG.
6. Self-contained — ALWAYS READY FOR ACTION.
7. All parts easily accessible.
8. Simple enough for any laborer to operate.

No. 1½
$100.00
F. O. B., N. Y.

LOW FIRST COST
LOW OPERATING COST

Distributors Inquiries Invited

No. 2
$160.00
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TRENCH & MARINE PUMP CO.

126 WEST 22ND STREET NEW YORK, N.Y.

Champion Super Service Steam Hose

Champion Super Service Steam Hose because of its tube—friction—cover and strong duck is the hose for the really hard work—the place where troubles have been experienced — the place where conditions call for safety first equipment.

Champion Super Service Steam Hose like other items of the Champion Group is a "Superservice" piece of merchandise.

CHAMPION SUPER SERVICE STEAM HOSE

WHEN you purchase any item of Republic's complete line you may be sure that no similar product is capable of giving better service results.

Having exercised every care to insure quality, Republic takes advantage of correct and economical marketing plans so the consumer may procure maximum quality without excess cost. Industrial Supply distributors are specialists in rubber supplies—the many lines they handle reduce distribution costs. Republic uses them and recommends them for your consideration. Let us inform you where the nearest Republic Distributor is stationed.

THE REPUBLIC RUBBER CO.
Youngstown, Ohio

Belting - Packing - Hose
Molded Goods - Lathe Cut Goods

REPUBLIC means the Best Mechanical Rubber Goods

DRIVE

Steel Sheeting with UNION Hammers

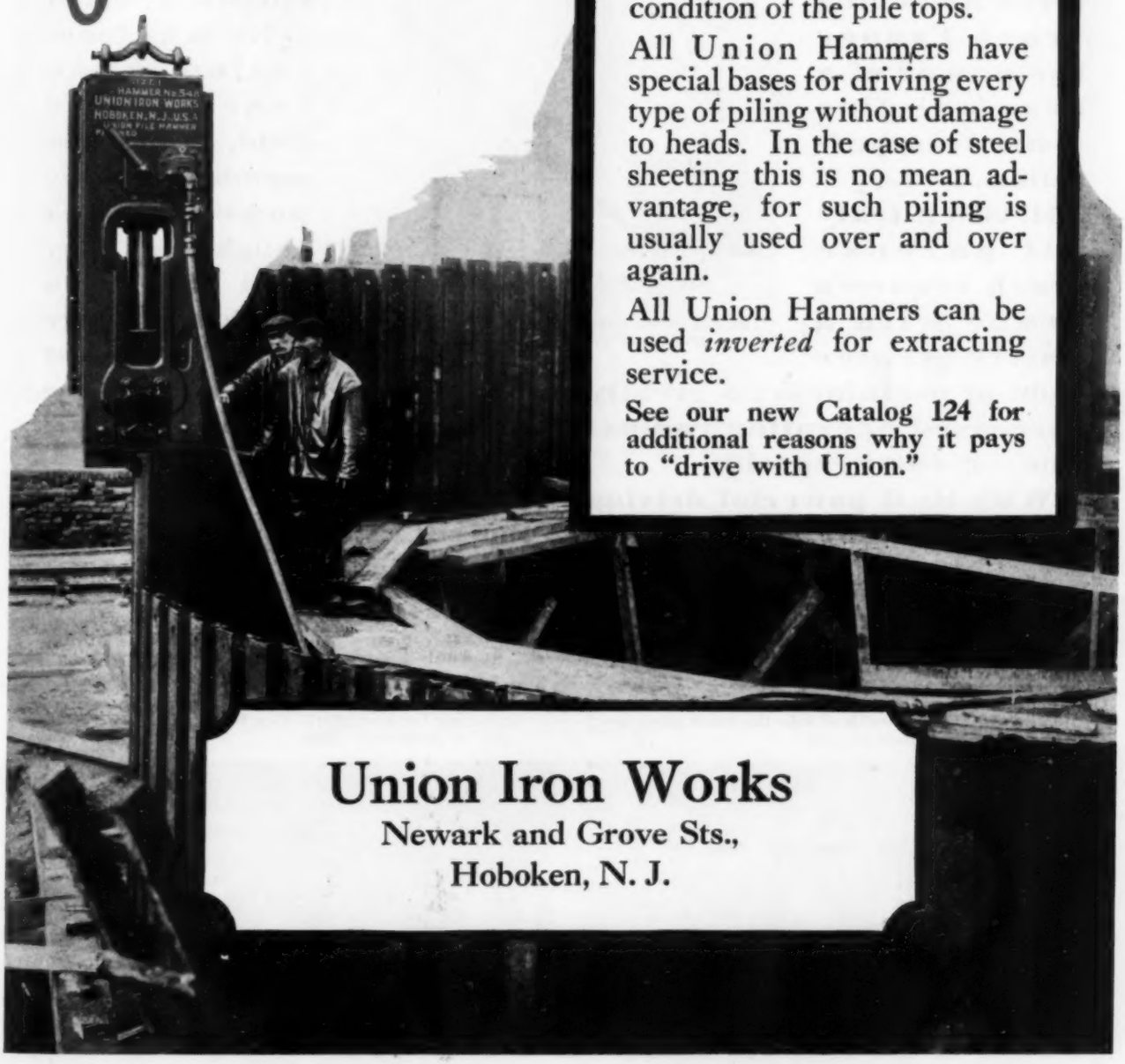
Here you see a size 1 Union Hammer driving steel sheeting for a large cofferdam in England.

The hammer is being used without leads. Note the even penetration and the perfect condition of the pile tops.

All Union Hammers have special bases for driving every type of piling without damage to heads. In the case of steel sheeting this is no mean advantage, for such piling is usually used over and over again.

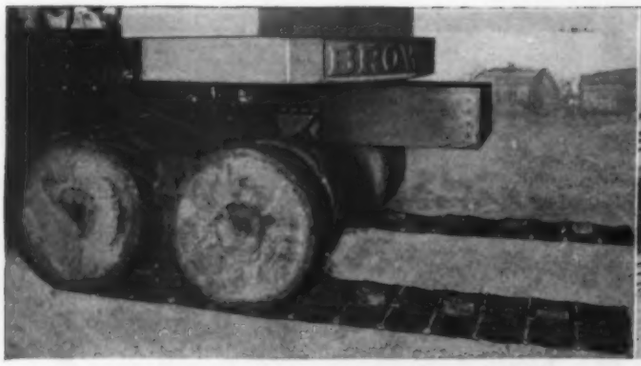
All Union Hammers can be used *inverted* for extracting service.

See our new Catalog 124 for additional reasons why it pays to "drive with Union."



Union Iron Works

Newark and Grove Sts.,
Hoboken, N. J.



The Crawler Treads are applied like ordinary tire chains—easy to put on, easy to take off. Only under the most adverse conditions are the treads required.

The extreme flexibility of the Browning-Christie Eight-Wheel Drive makes passable deep ruts, mud, snow and sand which are ordinarily impassable.

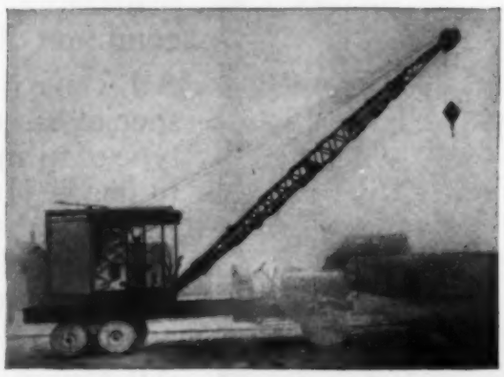
The Browning-Christie 8-wheel Drive . . .

gives Browning Truck Cranes the power of a crawler—plus faster transportation.

Here's a truly all purpose truck crane—a crane with a vastly greater field of usefulness; a greatly increased operating radius; and a greater capacity.

With its 8 powerful driving wheels, the new Browning-Christie 8-wheel drive is an innovation in the truck crane field. It has tremendous pulling power, makes rough going easy and gives you truck or crawler performance at will. The crawler treads are quickly attached or detached like tire chains.

Send for complete information—it will pay you.



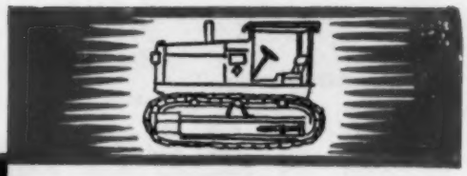
The Browning-Christie 8-wheel drive fits any truck and gives it a dual utility.

THE BROWNING CRANE CO., *16226 Waterloo Road*, Cleveland, Ohio, U. S. A.
Branch Offices: **New York, N. Y. Chicago, Ill.**

Distributors: **Portland Los Angeles New Orleans Montreal Toronto Albany Buffalo Minneapolis Birmingham San Francisco St. Louis Syracuse Philadelphia**

Where the ground is unusually soft, the wide crawler treads "ride the surface" and take the truck anywhere —even over the softest ground.

The eight displacement wheels will not mire and require less tractive effort. Can be equipped with either solid or pneumatic tires.



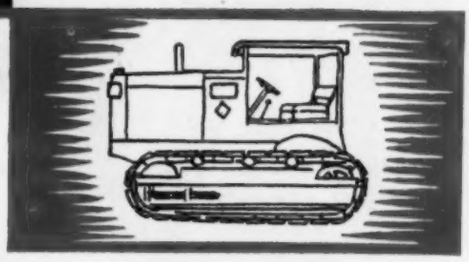
FIFTY

Drawbar horse power, 50. Speeds: First, 1.81—Second, 2.74—Third, 3.96—Reverse, 3.17 M. P. H.

Price $3540.00

F. O. B. Springfield, Illinois

When Tractor Meets Job More than Halfway



TOP maintenance work . . . tough grader operations . . . heavy hauling . . . in fact on any kind of work where more power, greater economy and superior performance is required of a tractor—the Allis-Chalmers-Monarch will meet the job more than halfway. For, there's no faltering to track or power when the Monarch lends its might to the doing.

Much of the popularity of the Allis-Chalmers-Monarch with the dirt mover is due to its unique combination of low weight and great drawbar pull. Perfect balance has been achieved by distributing the weight of the Monarch in such a way that the center of gravity falls well ahead on its unusually long tracks.

Your dealer can show you, in either the Allis-Chalmers-Monarch "50" or "75", a tractor priced and powered to suit your requirements. Ask for a demonstration.

SEVENTY-FIVE

Drawbar horse power, 78. Speeds: First, 1.55—Second, 2.64—Third, 3.56—Reverse, 2.64 M. P. H.

Price $5350.00

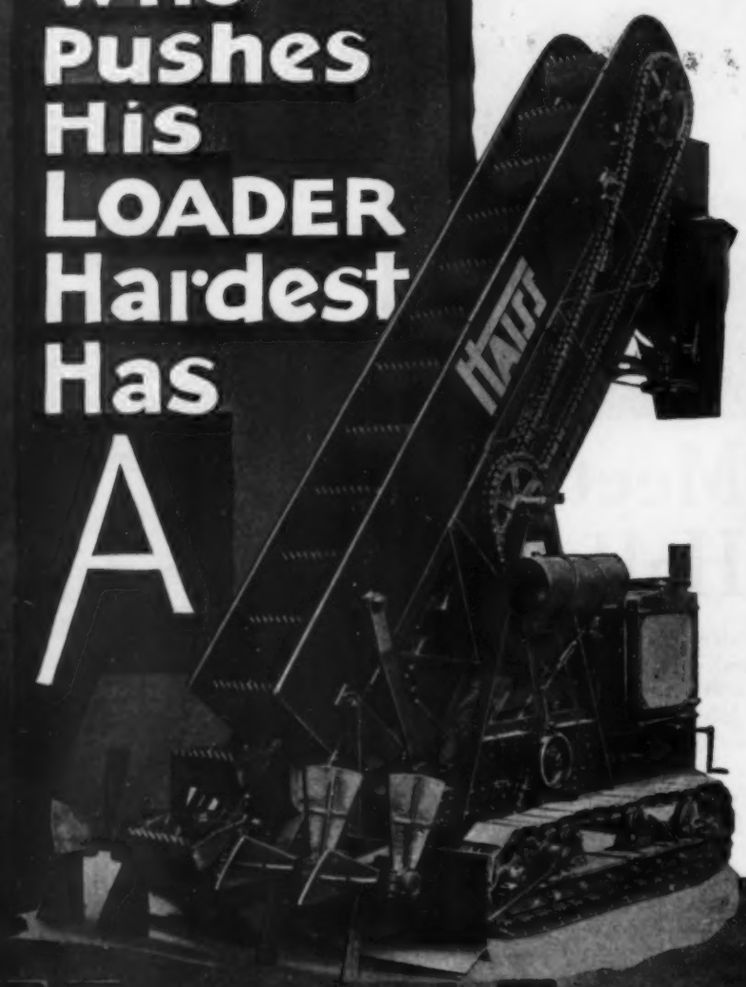
F. O. B. Springfield, Illinois

ALLIS-CHALMERS MANUFACTURING CO.
Monarch Tractors Division Milwaukee, Wis.

Monarch Tractors

Ten to One

The Man Who Pushes His LOADER Hardest Has A



BECAUSE it is bigger, heavier and more powerful, the Haiss Creeper Loader has a work-ability second to none. And there's more than enough extra life in its Manganese and Alloy Steel digging parts to warrant the slight difference in initial cost.

Haiss Loaders have a Special Loader Transmission which houses (sealed in oil) the slow speed "Crowding Drive"—a low speed that keeps the propellers and buckets constantly digging against the pile.

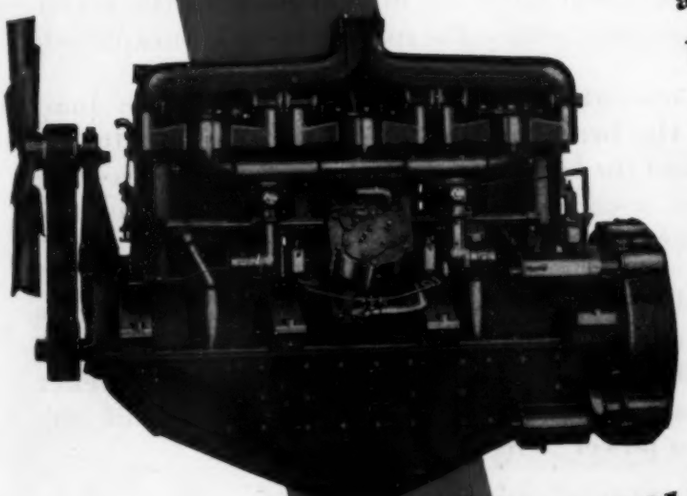
There are many other points of interest to you in Catalog 527—Why not ask for a copy?

GEORGE HAISS MANUFACTURING CO., *Inc.*
139th St. & Canal Place
New York, N.Y.
Representatives in Principal Cities

HAISS LOADER

"The Loader That Can Crowd Continuously"

Power



SMOOTHER power, more economical power, surplus power—that's what the Le Roi Engine provides. It boasts of greater flexibility, greater acceleration and less vibration.

It's the power that gives *action* to most construction jobs—the power upon which the majority of contractors depend for profit.

Le Roi's the *power* of wide acceptance and second to none for economy of operation.

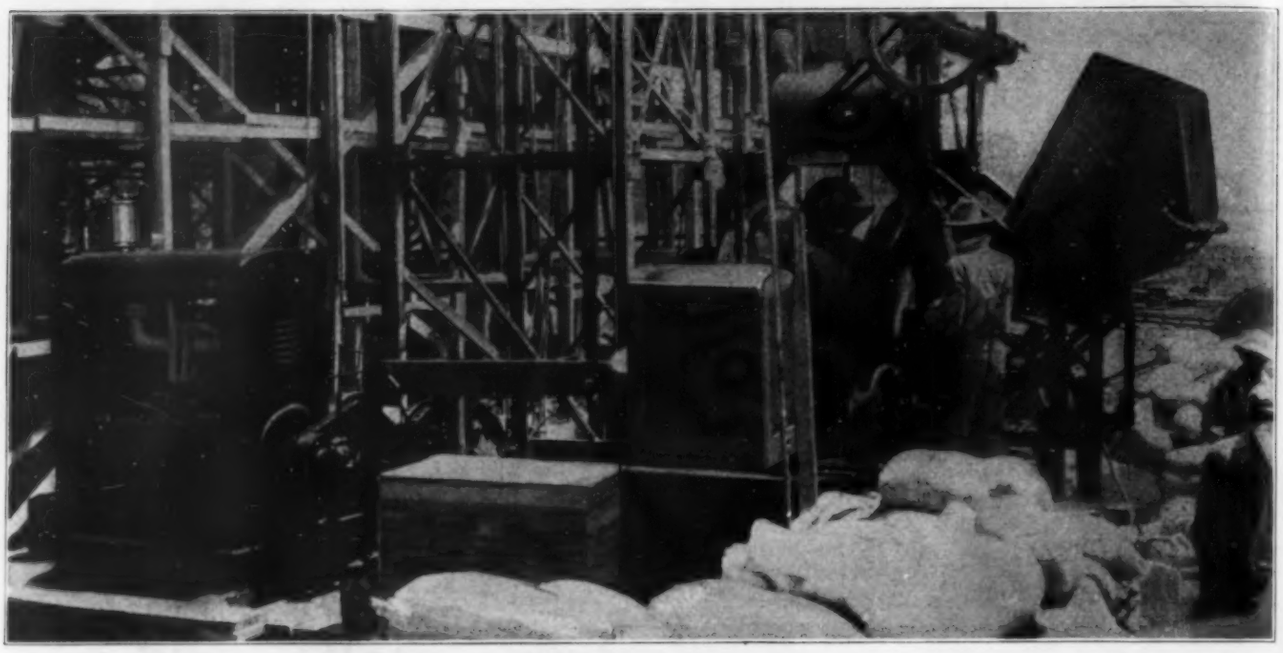
LE ROI COMPANY, Milwaukee, Wis.

LE ROI ENGINES

3 *to* 170 HORSE POWER

Speed—Reserve Power—Steam Throttle Control

Handling Concrete Buckets on Towers or Masts



With Novo Welded Tubular Constructed Hoists

Harahan Bridge Job
Fuller Construction Company, Contractors

The XF-DH 325 50 H. P. Novo Hoist—concrete chuting tower—and Ransome mixer, powered by a Novo 25 H. P. Engine, are all mounted on a traveler car, which is moved approximately 100 feet at a time.

If you would like to know more about Novo Hoists—how they are cutting costs on other contracting jobs, many of them like your own—how the rigidity of Novo welded tubular construction assures years of trouble-free operation—write for a copy of the Novo Hoisting Handbook.

The high speed of Novo Hoists enables them to lift the concrete bucket to the top of the tower—unload—and have the bucket back to the mixer consistently before the mixing cycle is completed.

The operator doesn't have to hold the load with the brake and speed up the engine to lift the load the last few feet. For the abundant reserve power overcomes the reduced leverage as the drum fills up with cable.

In addition, the "steam throttle" control gives new smooth bucket action. And with throttle closed, the double fly wheels help carry the bucket the last few feet, preventing overrun. And the "extra power" engine doesn't stall.

NOVO ENGINE COMPANY, 214 Porter Street, Lansing, Michigan
CLARENCE E. BEMENT, Vice-Pres. and Gen. Mgr.

NOVO

PUMPS—ENGINES—HOISTS

Service, parts and sales in over 70 cities

Mind these P's and Q's

Portability

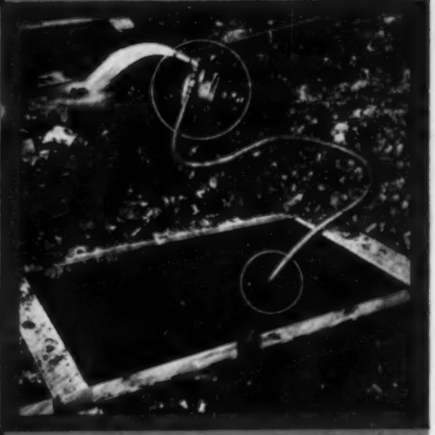
One hand carry.
Weighs but
75 lbs.

Pump-ability

Pumps the hole
dry . . . and
keeps it dry.

Prime-ability

Self priming.
Has no foot valve
and needs none.



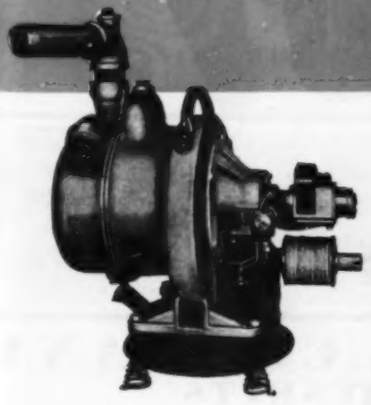
Quality

Oversize ball bearings.
Bronze open type
impeller.
Waterproof magneto.

Agents all over the world
for demonstration and service.

Quantity

Capacity
up to 6000 gal.
per hour.



HOMELITE

Portable Self Priming Centrifugal Pump

HOMELITE CORPORATION, 75 Riverdale Ave., Port Chester, N. Y.

3330

A THOUSAND POUNDS IN 41 SECONDS *with* The GENUINE O. AMES

The winner of a loading contest, using a genuine O. Ames, shoveled one thousand pounds of washed sand into a box 3½ feet above the platform.

The smooth swing and clean load, made possible by the famous Ames, bend and scientifically designed blade, produce more work with less effort. Workmen will greatly appreciate the new Ames R-MOR-D handle with the big roomy grip smooth sides and rounded edges strong as an ox exclusive on Ames Shovels.

The genuine O. Ames shovel bearing the signature "Oliver Ames" is the outstanding leader of an outstanding line. It will pay you to "look for the stars" on every shovel you buy.

GENUINE O. AMES

279

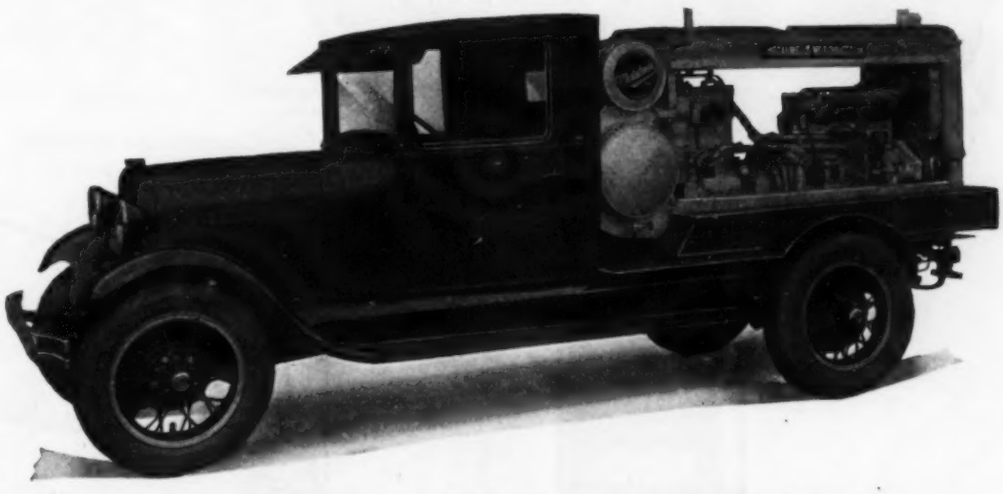
AMES SHOVEL AND TOOL COMPANY
NORTH EASTON ◂▸ MASSACHUSETTS
ST. LOUIS, MISSOURI - - - ANDERSON, INDIANA

METALWELD — WORTHINGTON

AIR KING

Portable Air Compressors

THE HARTFORD ELECTRIC LIGHT COMPANY of Hartford, Conn., are enthusiastic about their 110 cu.ft. "M-W" "AIR KING" Compressor which is here shown in paving-breaker operation. The compressor is mounted on a standard Dodge Bros. chassis.



Standard Ford or Chevrolet 1½ ton truck units mounted with 110 cu.ft. "M-W" "AIR KING" compressors are ready for immediate delivery @ $2,380.00 f.o.b. Philadelphia. The unit here shown is mounted on a standard model "AA" Ford truck.

INVESTIGATE the qualities of the "AIR KING"! Prove to your own satisfaction that the Metalweld-Worthington "AIR KING" Compressors are the last word in mechanical perfection for air compressor duty: built and guaranteed by an organization who have been quality builders of compressed air machinery for the past 30 years.

The various inbuilt quality features of Worthington compressors include the famous "Feather Valve," the "Trigger Valve" unloader, Force Feed Lubrication to every moving part, Heavy Counter Balanced Crank Shaft, and Improved Cooling System.

Metalweld-Worthington "AIR KING" Compressors are built in the following sizes: 28, 110, 160, 210, 280, and 330 cu.ft. displacements. Mountings are provided for every class of out-door construction work: Towabout, Tractor and Rail Car models.

METALWELD, INC., 26TH AND HUNTING PARK AVE., PHILADELPHIA

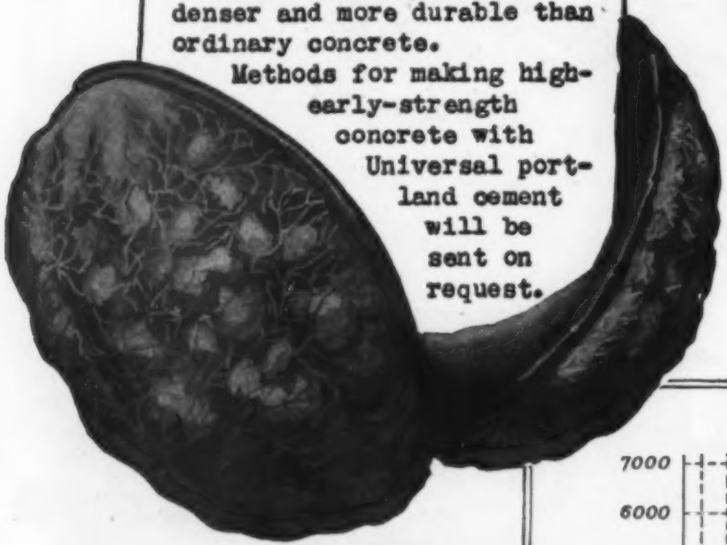
DEALERS IN PRINCIPAL CITIES

The Whole Story in a Nutshell

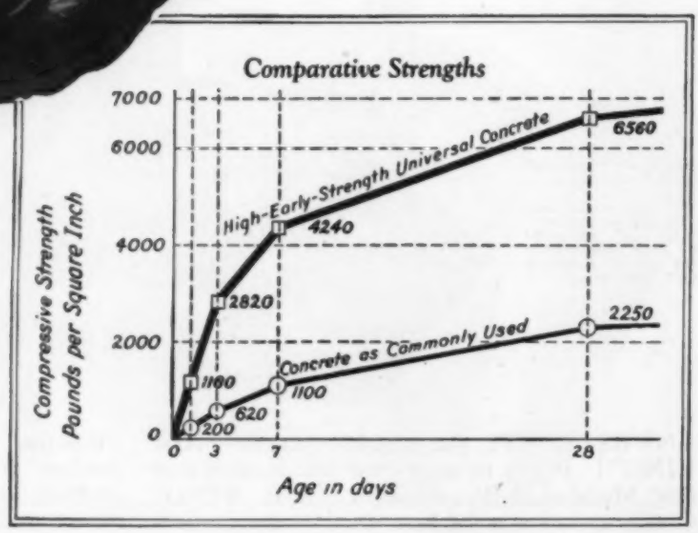
With the same Universal cement that has been used over a quarter of a century for durable concrete, you can secure in 3 days stronger concrete than is commonly obtained in 28 days.

High-Early-Strength Universal concrete, as shown in the graph, not only has a high 3-day strength but also is permanently stronger, denser and more durable than ordinary concrete.

Methods for making high-early-strength concrete with Universal portland cement will be sent on request.



Send the coupon for your copy



Name _____

Address _____

Universal Portland Cement Co.
208 So. La Salle Street, Chicago

Without obligation, please send me the following booklet:

- ☐ High-Early-Strength Concrete
- ☐ General Building Edition
- ☐ Paving Edition

C.M. 4-29

One Standard Cement for All Concretes and Mortars

Universal Portland Cement Co.

Subsidiary of UNITED STATES STEEL Corporation

Chicago Pittsburgh Minneapolis Duluth Cleveland Columbus New York

Concrete for Permanence

Construction Methods

McGraw-Hill Publishing Company, Inc.
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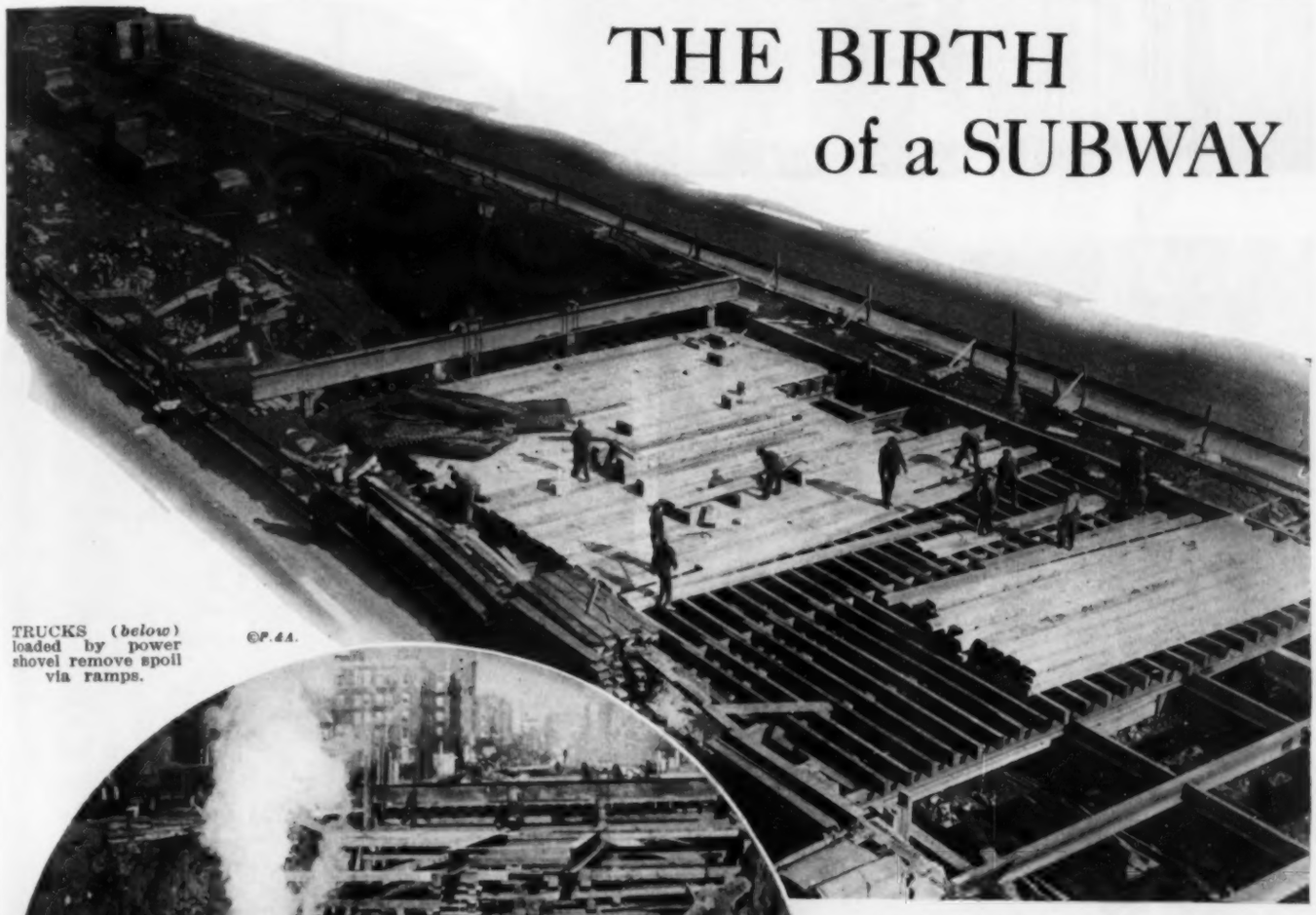
A monthly pictorial of field practice and equipment illustrating successful construction, maintenance and material-handling methods for general construction, highways, buildings, industrial plants and public works and utilities

ROBERT K. TOMLIN, *Editor*

Willard Chevalier
Publishing Director

Volume 11 | NEW YORK, APRIL, 1929 | Number 4

THE BIRTH of a SUBWAY



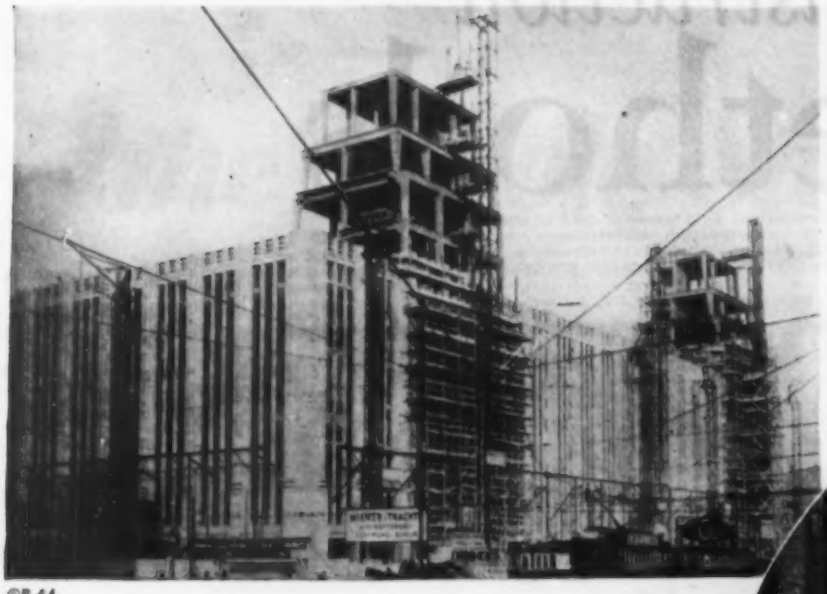
DECKING (*above*) of heavy planks is carried by wooden stringers on I-beams spanning the cut.

TRUCKS (*below*) loaded by power shovel remove spoil via ramps.

©P.44.

IN BUILDING a section of New York subway by present-day methods the first construction operation consists in placing timbering and decking to cover the cut and allow the movement of traffic. Here are two views showing in detail how the Slattery-Daino Co., Inc., started its $5,232,000 job along the Grand Concourse in the Bronx. Transverse steel I-beams, with bracing struts, support wooden stringers carrying the deck planking. Spoil is loaded by power shovel into motor trucks which enter and leave the cut by means of ramps. During 1928 the Board of Transportation placed $80,000,000 worth of subways under contract. Robert Ridgway is chief engineer.

This Month's



©P.A.

BERLIN DEPARTMENT STORE (*left*) of the Rudolf Karstadt A.-G. has just been completed. The towers, approximately 215 ft. high, make a new landmark in the German capital. Four stone setting derricks may be seen at work on high steel towers along the walls. The building has 24 escalators and an elevator for automobiles.

OWYHEE DAM SITE, Owyhee River, Ore., where General Construction Co., Seattle, will build dam 405 ft. high for Bureau of Reclamation. Note diversion tunnel (*left*), and talus from abutment keyway excavation.

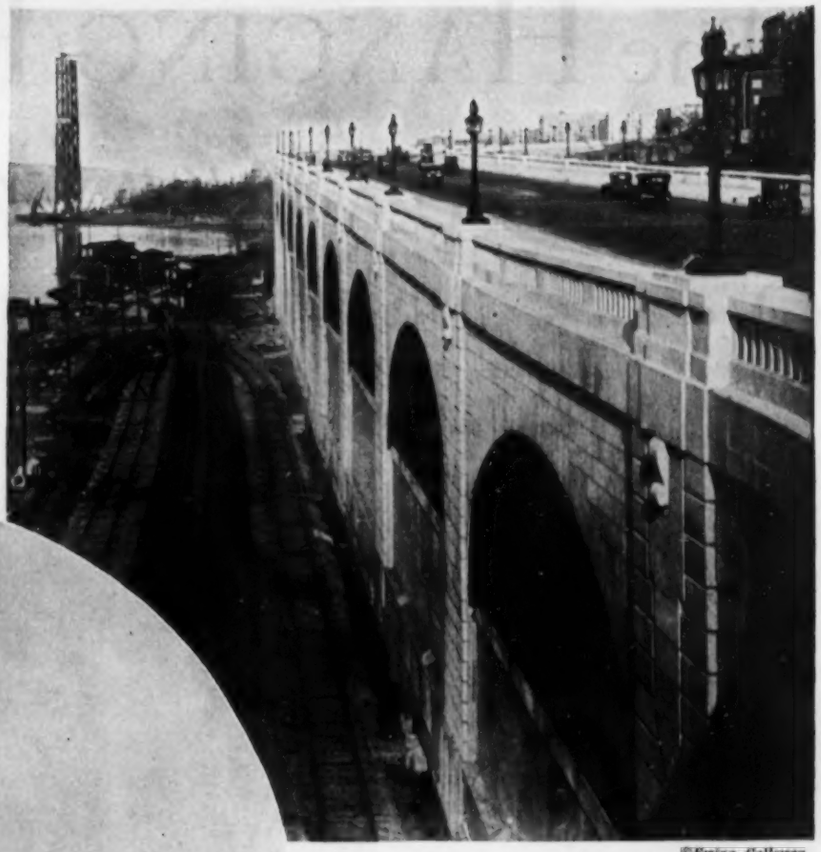
FIRST STEEL arrives in Chicago for Merchandise Mart and is inspected by James Simpson (*left*) president, Marshall Field & Co., and Ernest R. Graham, of Graham, Anderson, Probst & White, architects.

©International

CONCRETE ARCH BRIDGE approximately 400 ft. long across the Oise River at Conflans, France, is constructed on timber centering supported by cables from four towers erected on pile piers.

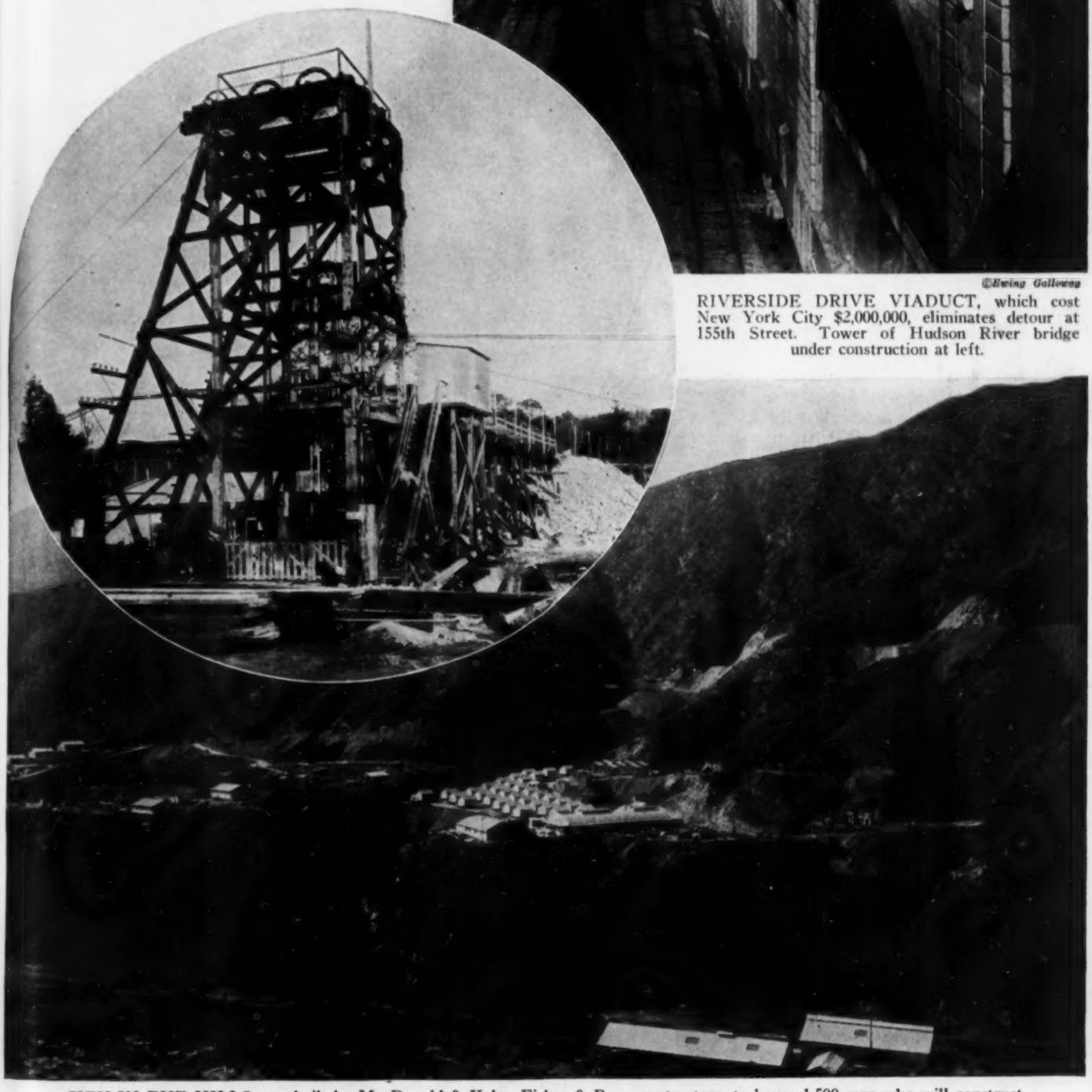
"News Reel"

HEADFRAME (*below*) of typical shaft on 13½-mile Wachusett-Coldbrook tunnel which Metropolitan District Water Supply Commission, of Boston, is driving to tap an additional supply. Frank E. Winsor is chief engineer, and contractors are: J. P. Porter, Portland, Ore., east portion; and Coughlan & Porter, Boston, west portion.



©Ewing Galloway

RIVERSIDE DRIVE VIADUCT, which cost New York City $2,000,000, eliminates detour at 155th Street. Tower of Hudson River bridge under construction at left.



CITY IN THE HILLS was built by MacDonald & Kahn, Fisher & Ross, contractors, to house 1,500 men who will construct San Gabriel Dam for Los Angeles County Flood Control District,—E. C. Eaton, chief engineer.

The HANGING HIGHWAY *of Zion Park*

OVER or through all the obstacles that the rugged topography of Southern Utah can place in its way, the Nevada Contracting Company, of Fallon, Nev., is driving an easterly highway outlet from Zion National Park. The road scales the steep talus slopes of the region, clings to the base of its towering cliffs, and burrows through the sandstone walls of the varicolored canyons.

A 65-mile highway to the west and north connects the park with Cedar City, Utah, and the railroad. Construction has almost been completed on the 25-mile easterly continuation of this road which will extend it to the Kanab-Salt Lake City highway at Mount Carmel.

Practically 9 miles at the western end of the new link lies in Zion National Park. The Bureau of Public Roads let this portion in three contracts to the Nevada Contracting Company. Section 1, approximately 3 miles long, rises 3,000 ft. from the junction of Deep and Pine Creek canyons and terminates in a series of five switchbacks which climb 800 ft. up the steep talus slope from Pine Creek. Section 2 starts at this point with a 5,500-ft. tunnel along the vertical side of the canyon.

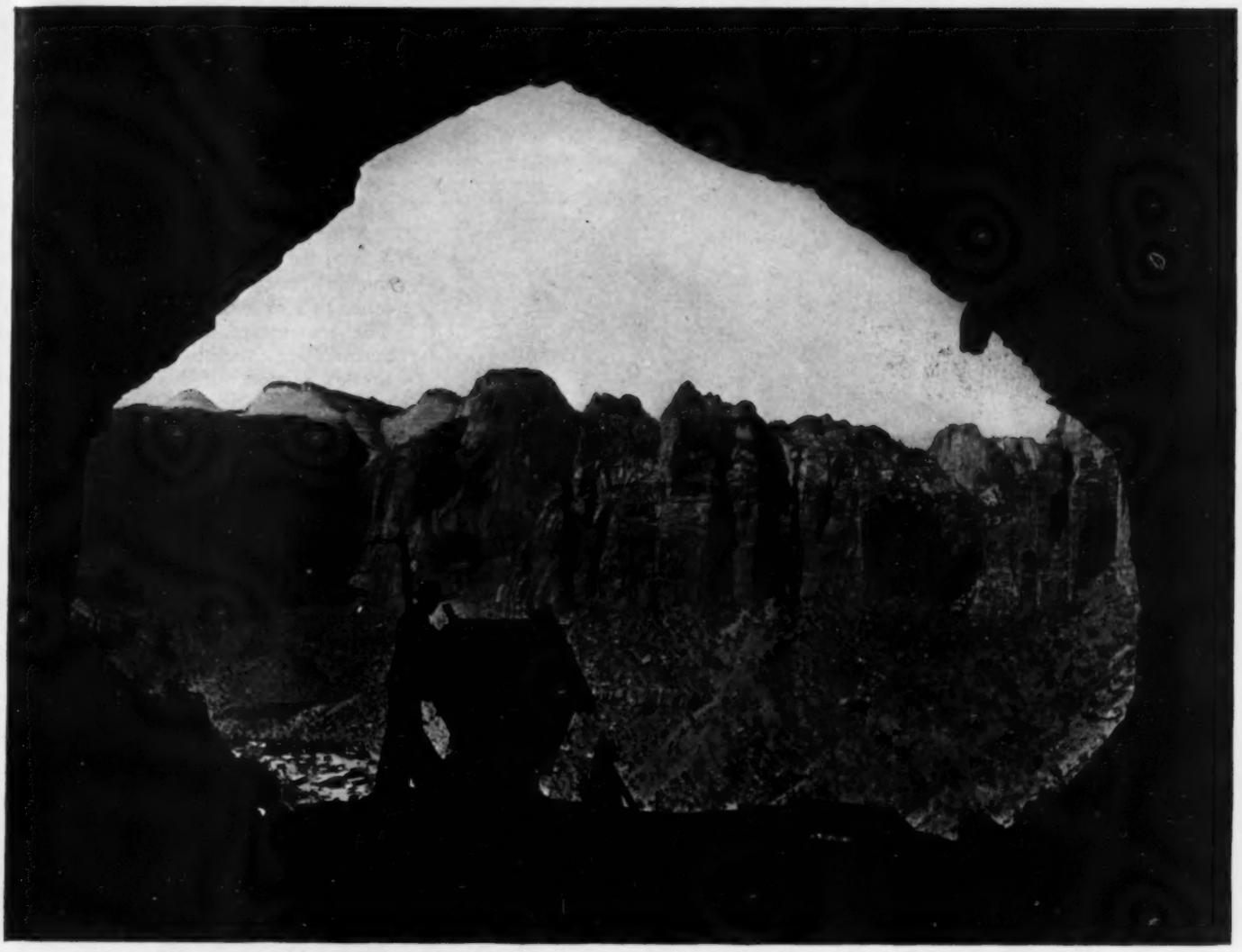
Transportation—The Nevada Contracting Company hauled all its equipment over the 65-mile highway from Cedar City and up a pioneer road which it constructed along the alignment of the projected switchback road. As the grade up the talus slope was too steep for hauling heavy equipment, a cableway 1,200 ft. long with a rise of 800 ft. was erected to the base of the cliff. This aerial tramway, equipped with American wire cable, hauled shovels, motors, air compressors, and other heavy equipment to the top of the talus slope, where a 40-ft. tower permitted them to be landed properly. The 3,000-lb. compressor frames were the heaviest pieces thus transported.

Grading of the switchback approach was heavy and difficult, involving 300,000 yd. of excavation and 460,000 sta.yd. of overhaul. Disintegrated sandstone and boulders composed the material. Strong winds would undermine the dry sandstone slopes and cause slides. Drilling and blasting broke up the large boulders for handling by the three P & H gasoline shovels (two ½-yd. and one 1¼-yd.) employed on the grading.

AN INCLINE affords the means of bringing timbers up to one of the galleries. In the background are some of the switchbacks of the approach to the tunnel portal.

Tunnel Operations—It was impossible to get men and tools into position to start drifting at the portal of the projected tunnel. To overcome this difficulty, galleries were opened on the tunnel grade line at more accessible points along the face of the cliff, either from scaffolds erected at the top of the talus slope or from suspended working platforms. The scaffolds varied in height from 30 to 90 ft. When the first gallery reached the tunnel line, a heading was driven from the juncture to the portal.

Two galleries were opened at first. From each gallery, 8x10-ft. headings were driven in both directions at tunnel grade. Butler air shovels loaded the broken rock at the headings into muck cars traveling on narrow-gage track. The tunnel rises on a 5 per cent grade from west to east, making some mechanical means necessary for raising or lowering loaded muck cars from the working faces. A portable Sullivan air hoist handled cars from both directions at each gallery. The



GALLERIES open from the tunnel to the sheer face of the canyon wall at six points. Muck cars are hauled to the galleries by portable air hoists and are dumped at the face.

cars were run out to the face of the cliff and dumped.

Enlargement—Sullivan stoping drills mounted on columns erected along the center line of the pilot tunnel performed the ring drilling necessary to enlarge the bore to its full size, 16 ft. high by 22 ft. wide. One set-up of the column and drill sufficed for a full round of holes. A plate on the mounting bore radial lines which aided the operator in spacing his holes. As several drills could work at the same time under this system, the drilling for enlargement progressed rapidly.

Softness of the sandstone resulted in high drilling speed. One stoper in an 8-hour shift put in as many as 45 7-ft. holes, a total of 315 ft.

Enlargement operations started at the portal, where a Bucyrus-Erie shovel began its task of loading the blasted rock into motor dump trucks. Six galleries, opened at intervals of 300 to 1,200 ft. along the tunnel for purposes of ventilation, range in length from 60 to 120 ft. They are wide enough to permit an automobile to turn.

Air Supply—During the 2½ months

HEAVY GRADING in the disintegrated sandstone and large boulders of the talus was necessary to build the approach road to the tunnel.

The HANGING HIGHWAY

WATER JET STOPER of the self-rotating type, with reverse feed cylinder, drilling in the pilot tunnel for enlargement to full bore.

required to construct a 25-mile transmission line from the Dixie Power Company's hydro-electric plant at La Verkin, on the Virgin River, portable compressors supplied the air for the numerous pneumatic machines and tools. When the line was completed and a transformer station installed, two 125-hp. Fairbanks-Morse motors were connected to two Sullivan 17-10¼ x14-in. angle compound compressors. One of the portable compressors later was used as an auxiliary source of supply behind the Bucyrus-Erie shovel.

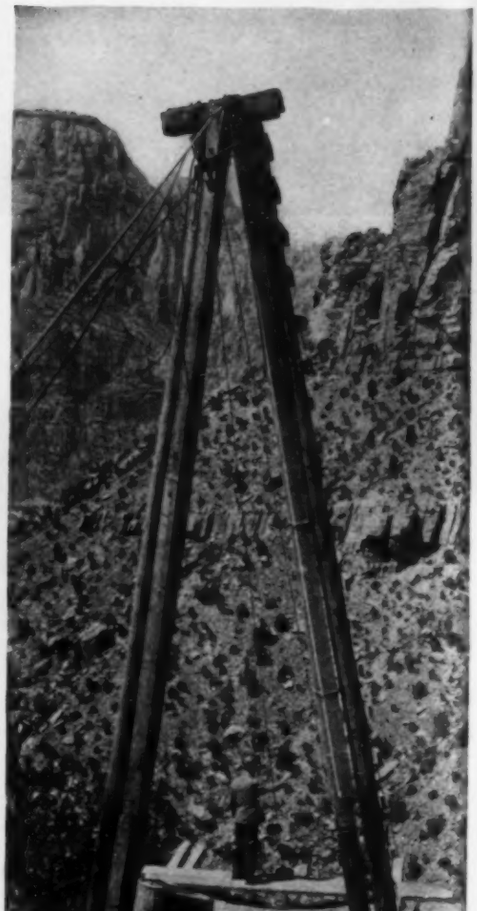
Because of the softness of the rock in the tunnel and its tendency to disintegrate, it was found necessary to timber 650 ft. More of the tunnel may be lined with timber or concrete. Sloughing in a vehicular bore is likely to result in serious accidents. The wide roof spans of the galleries especially are being watched. In spite of delays resulting from timbering and the awkward location of the work, the tunnel advanced at an average speed of 900 ft. a month at all faces.

Now Under Construction—Section 3, 3.63 miles long, at the east side of the park, could not be reached until the other two sections had been completed. The contractors built a 60-ft. bridge across Pine Creek to get equipment on to this section. Transportation is by pack horse only. About 200,000 yd. of solid rock excavation is involved, 500 lin.ft. being in tunnel.

The Raleigh-Lang Company is constructing 2 miles at the east end of Section 3 under subcontract. Two Northwest shovels, seven dump trucks, and three Sullivan air compressors are being used on this portion. George Shea is doing the masonry and bridge work. Completion of the section is scheduled for July 1, 1929.

The Nevada Contracting Company

TIMBERING is necessary in a good part of the tunnel because of the tendency of the soft rock to disintegrate, as indicated by the finely pulverized detritus in the roadway.



CABLEWAY TOWER at the top of the talus slope is 40 ft. high to permit unloading of large equipment.

# of Zion Park

received the awards of Sections 1 and 2 on Aug. 10, 1927, for a total bid price of $607,058. These two sections were practically completed by Jan. 1, 1929, the pilot tunnel having been holed through on Sept. 20 and the enlargement completed about Oct. 20. Section 3 was awarded to the same contractor on Sept. 27, 1928, for a price of $315,906.

Personnel—E. S. Berney, president of the Nevada Contracting Company, is in general charge of the project for his concern. Stanley Bray superintends operations in the field, and Richard Scott is foreman in charge of tunnel work.

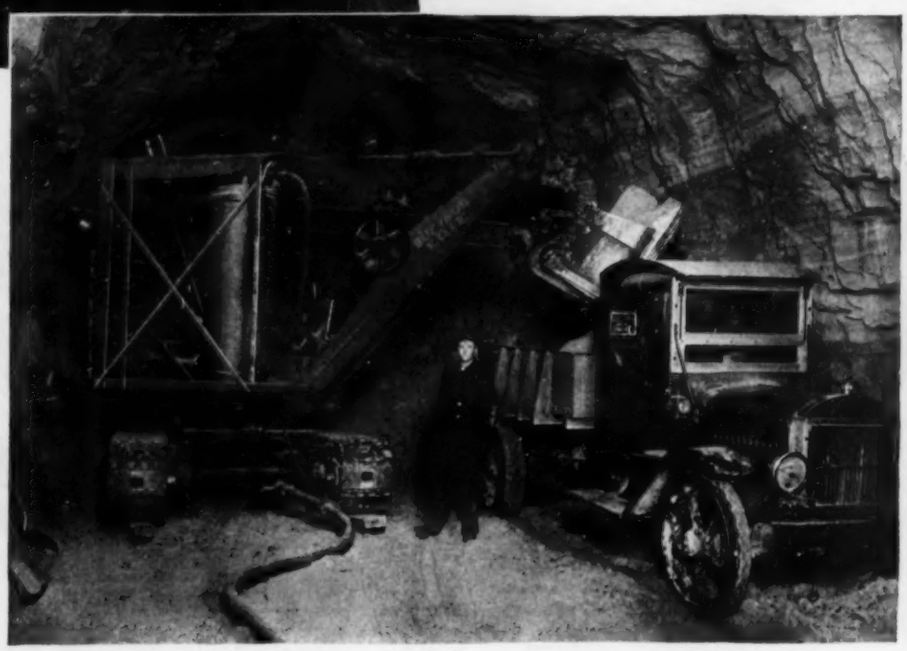
AIR SHOVELS excavate the muck in the headings.

PILOT TUNNEL is formed by headings driven at tunnel grade in both directions from the galleries.

of Public Roads, Ogden, Utah, has been in direct charge of design and construction of the project. His able assistant on the ground is R. A. Brown, resident engineer.

Surveying—The inaccessible location of the highway on the side of a narrow box canyon presented serious difficulties in surveying the tunnel. The engineers established points in the curves by triangulation from the opposite side of the canyon as the galleries were excavated.

POWER SHOVEL (*below*), operated by air, loads trucks with the blasted rock from the tunnel enlargement.



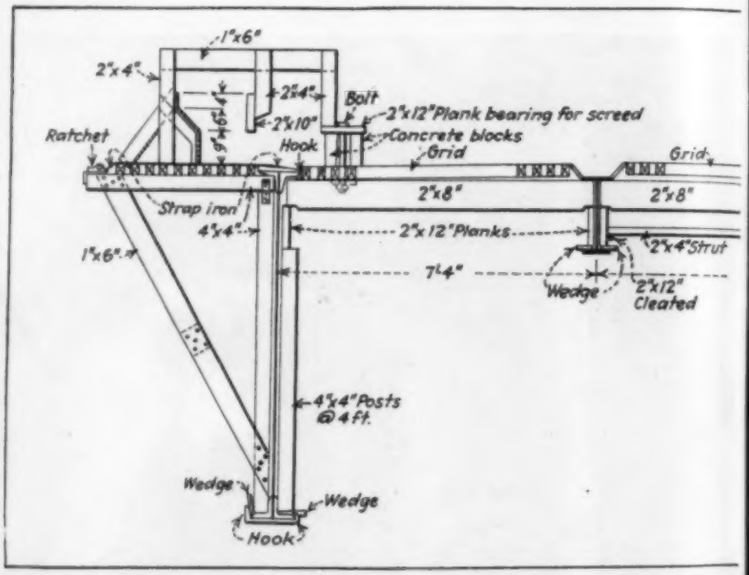
Supervisory responsibility for the design and construction of the highway rests with Horace M. Albright, assistant director, National Parks Service, and superintendent of Yellowstone National Park; E. T. Scoyen, superintendent of Zion National Park; C. E. Langley, assistant land architect, National Parks Service; and L. I. Hewes, deputy chief engineer, Bureau of Public Roads, San Francisco, Calif. It is through the courtesy of Mr. Hewes and the Nevada Contracting Company that the accompanying illustrations are reproduced in *Construction Methods*.

B. J. Finch, district engineer, Bureau

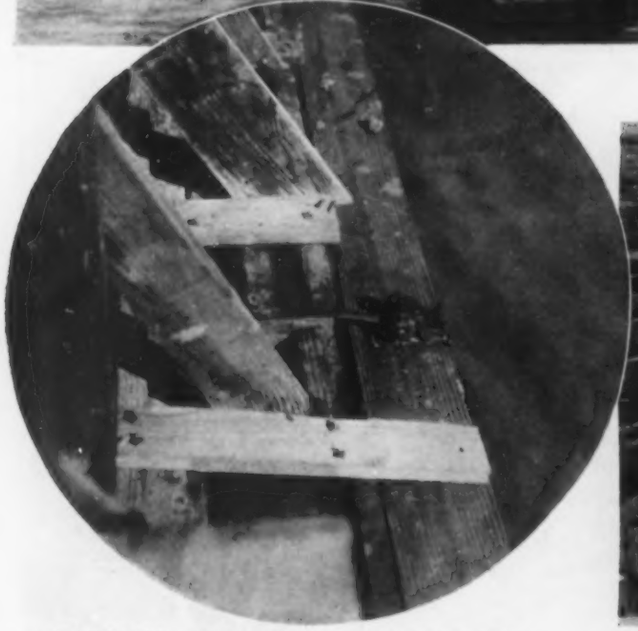
Step-by-Step

Placing DECK on Plate Girders

1 STEEL FRAME FLOOR SYSTEM of the Sandusky Bay Bridge consists of two outside 8-ft. plate girders and two intermediate 18-in. stringers framing into floor beams. Description of pier work appears on pp. 58 and 59.



2 OUTSIDE BRACKETS (*left*) wedged between the flanges of the girder and tied by strap iron to the top flange, support the curb form, which is cantilevered beyond the girder flange. A man, on a ladder hung over the side, wedges the brackets as they are placed from above.

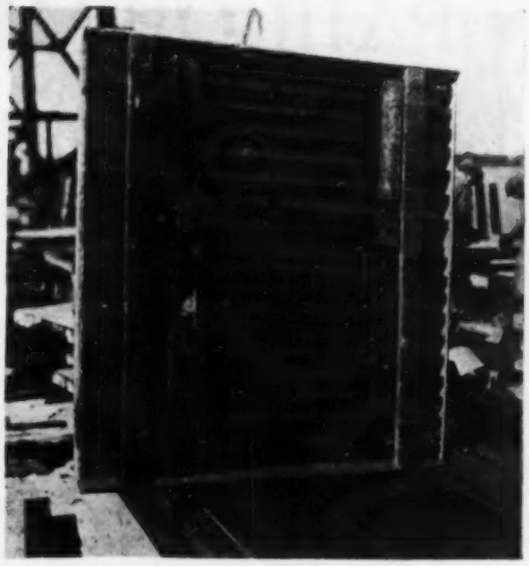


3 RATCHET at the outside edge of bracket tightens strap iron, the other end of which is hooked to the top flange of the girder.

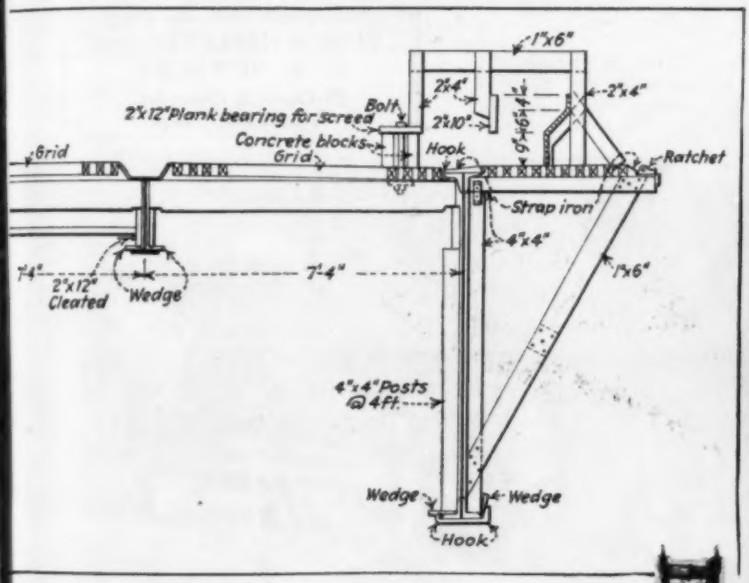
4 INTERIOR SUPPORTING SYSTEM is composed of joists spaced 30 to 36 in. apart and wedged between top flanges and planks supported from the bottom flanges of girders and I-beam stringers.

FORMS
and I-Beam Stringers

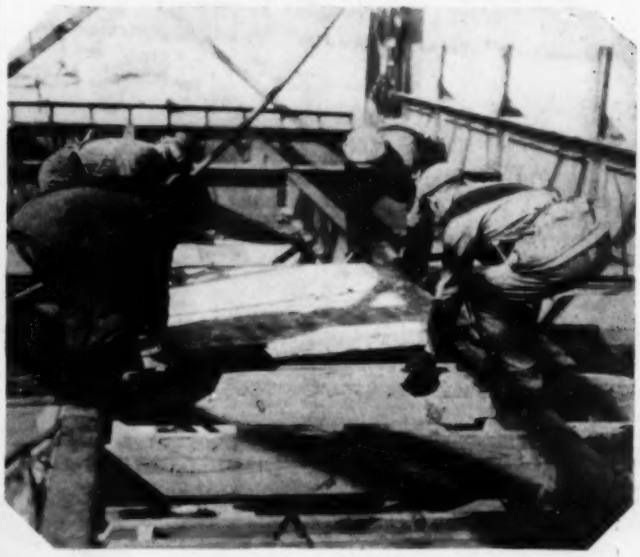
6 FORM PANELS *(right)* are wood gratings, approximately 6 ft. x 6 ft. 10 in. in size, covered with sheet metal. They are laid end to end along a row of joists and are wedged tightly together.



7 WORKMEN *(below, right)* place the panels, which just fill the space between flanges.



5 FORM SYSTEM *(above)* which permits rapid erection and wrecking for repetitive use was designed by A. Bentley & Sons Company, Toledo, Ohio, contractor for the bridge. Form panels, or grids, are wedged from center of each bridge panel, leaving an opening from which to start wrecking. Wire ties from reinforcing steel in 9-in. deck slab hold form panels in place while planks and joists are removed and carried ahead on monorail traveler.



8 ALL WORK connected with erecting and stripping the forms, except setting and wedging of joists and patching and wedging of panels, is performed by ordinary labor.

9 REINFORCING STEEL *(left)* is placed on the completed deck form. At the left of the photograph may be seen the concrete blocks and 2x12 planks which go to make the plank bearing for the screed, as shown in the drawing above.

PAIR OF MIXERS MAKES TIME
Building Curb and Gutter

A PAIR of mixers recently solved a paving problem for McGuire & Cavender, contractors of Texarkana, Tex. This company desired to rush a job at Magnolia, Ark., to an early completion and in order to speed up the work of building the curb and gutter, they hit upon the plan of using two mixers, one for the base and one for the top course. This method of constructing the 6-in. curb and 24-in. gutter proved entirely satisfactory from the standpoint both of production and of cost.

A Ransome 21E paving mixer was used for the base and was charged with a 6-sack, 1 : 2 : 3½ batch. A Jaeger 4A portable mixer provided the 1 : 2 mix for the top course which was ½ in. in thickness. The tools used in finishing were a curb and gutter mule, a long handled trowel shaped to the surface of the curb and gutter and a long handled edger for back and front edging. These tools enabled the contractors to produce a workmanlike job with a minimum of effort. The paving was in charge of C. A. Newbury, superintendent.

The McGuire & Cavender organization made an unusual speed record in 1926 in Bowie County, Texas, when it laid 1,331 ft. of Bates type road in one day. An account of this work was given in the December, 1926, issue of *Construction Methods*.

Photographs and data from
H. H. SHIFFLETTE *and*
C. A. NEWBURY
McGuire & Cavender, Texarkana, Texas

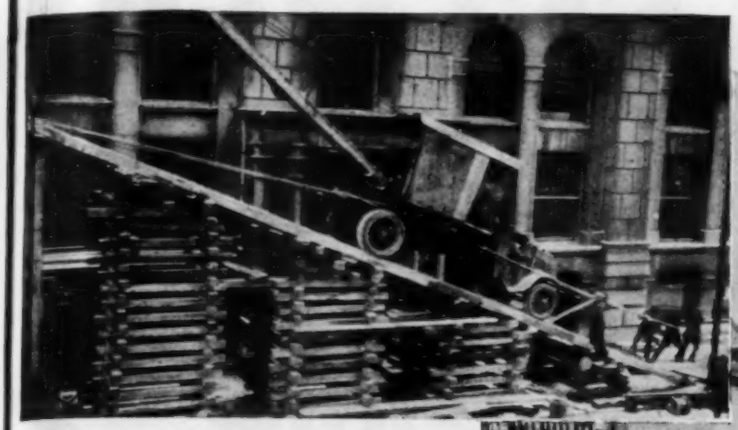
MATERIALS BIN from which trucks to feed the paving mixer pouring the base course were loaded.

BASE COURSE *(below)* for 6-in. curb and 24-in. gutter was poured in short order by this paving unit.

TOP COURSE CONCRETE was prepared by this small portable mixer and loaded from mortar box to wagons.

APPLYING TOP COURSE, which then was finished with hand tools.

TRUCK CRANE on Sidewalk Bridge Wrecks Stone Building



RAMP, 20 ft. high and 60 ft. long, formed the steep roadway up which the crane pulled itself to the deck of the first two trestle bays.

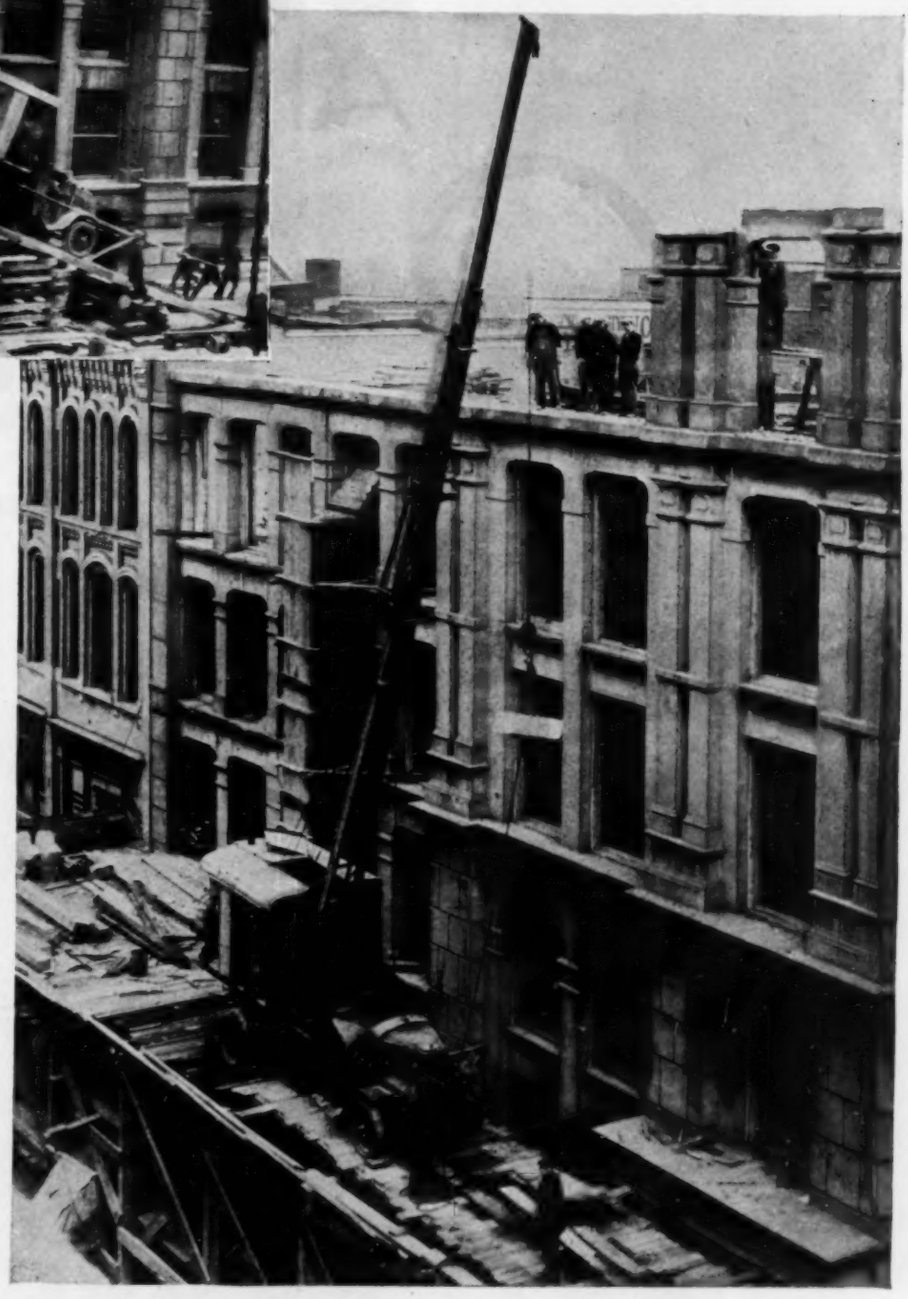
A SIX-STORY building with exterior walls containing stones weighing up to 3 tons stood in the way of the erection of a modern structure at Binghamton, N. Y. A. W. Bowie, Inc., of the same city, contracted to demolish the old building. By using a truck crane with extended boom working from a bridge over the sidewalk, the contractor saved time and netted a good profit.

A scaffold over the sidewalk was necessary to erect the new building on the site. This scaffold would cost $700 or $800. By increasing the expenditure to $1,200, A. W. Bowie, Inc., was able to build a trestle all around the building capable of carrying a Universal truck crane handling 3-ton stone.

The contractor erected two bays of the trestle on one side of the building. After the crane had been placed on these, it aided in the erection of the other bays.

To pull the crane up the 20-ft. rise to the deck, the contractor built a ramp 60 ft. long on timber cribbing. By using double blocks on the load line and winding 1¼-in. Manila ropes on the niggerheads, the machine pulled itself up the slope in 15 minutes.

To remove the stones, weighing up to 3,000 lb., from the upper wall, the boom length was increased to 65 ft. by means of the standard 16-ft. extension plus a wood tip adding 25 ft. more to its reach. When wrecking reached the fifth floor coping, where the weight of the blocks increased to a maximum of 6,000 lb., the wood extension was removed.



TRUCK CRANE removed 1,700 tons of stone from the walls of this six-story building. Demolition was completed well within the scheduled period of six weeks, and the crane remained on the bridge for use in erecting the new building.

A. W. Bowie, president of the contracting organization, states that the crane had numerous advantages over stiff-leg derricks. Derricks must be lowered from floor to floor as demolition proceeds, and they can load materials from a restricted area on to trucks spotted only at definite points. The crane installation, on the other hand, was unchanged for the duration of the job, covered all parts of the building, and permitted great flexibility in wrecking different portions and in spotting trucks at convenient points.

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Precast Units Expedite CONCRETE

THE Raymond Concrete Pile Company, general contractor for the 7.1-mile highway toll bridge across San Francisco Bay between San Mateo, 20 miles south of San Francisco, and Mt. Eden, 14 miles south of Oakland, accelerated construction to a considerable extent by the use of precast units for the piles, slabs, and railing of the concrete trestle portion, almost 7 miles in length. Planning, born of much experience, provided a balanced schedule, adequate plant, and steady production, three vital factors affecting the rate of progress. With the perfect co-ordination obtained, the company broke all records by opening the bridge March 2, 1929, 14½ months after starting operations and 106 days ahead of schedule.

Trestle Design—The concrete trestle consists of 1,054 30-ft. bays and 116 35-ft. bays. Four-pile bents carry the two duplicate precast slabs which form the deck for each bay. Each slab has a 10-in. floor cast integral with two longitudinal arched beams, which rest on the caps of the bents. Caps are poured in place.

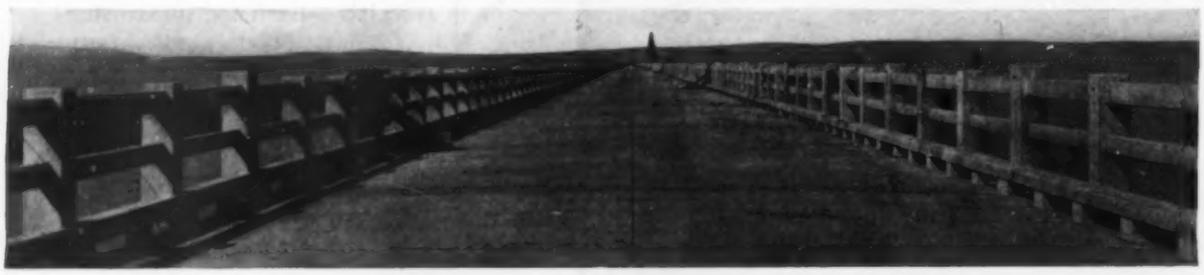
At every fifth bent the design provides an expansion joint between slabs and a six-pile bent with the four interior piles battered 1 : 6 longitudinally, two sloping each way. Rail posts are the only part of the rail and curbing cast in place.

Casting Yard—The Raymond Concrete Pile Company leased a suitable area accessible by rail and water at Alameda on the east shore of the bay 12 miles north of the bridge. Towing distance from this site was 20 miles.

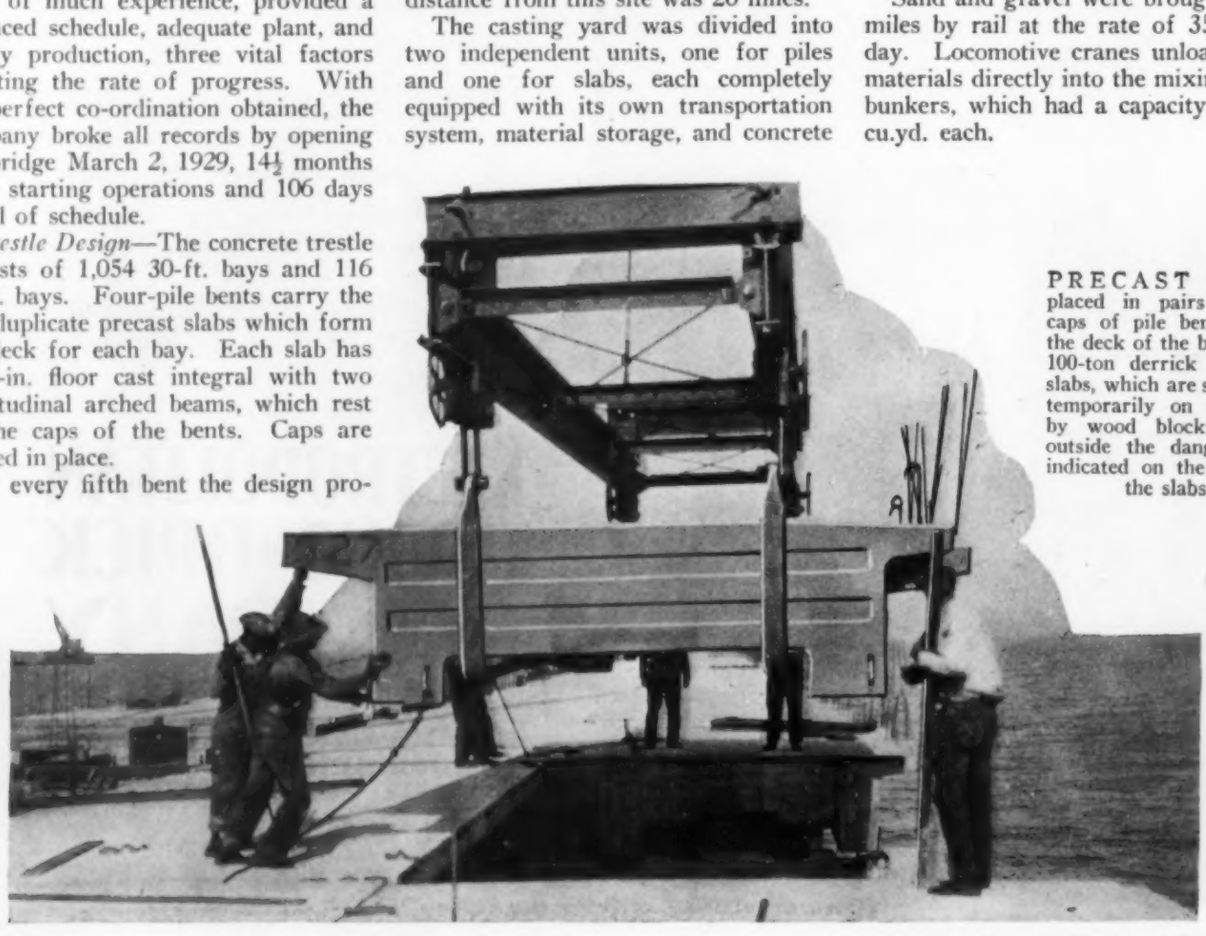
The casting yard was divided into two independent units, one for piles and one for slabs, each completely equipped with its own transportation system, material storage, and concrete mixing plant. In the pile casting division was a platform 120 ft. wide by 325 ft. long on which 200 pile forms could be set.

On the casting platform of the slab yard was a permanent set-up of slab forms arranged in a continuous double line 1,528 ft. long. In the slab division, also, was a separate section, served by its own mixing plant, for the casting of rail, curb, and other units.

Sand and gravel were brought in 35 miles by rail at the rate of 35 cars a day. Locomotive cranes unloaded the materials directly into the mixing plant bunkers, which had a capacity of 100 cu.yd. each.

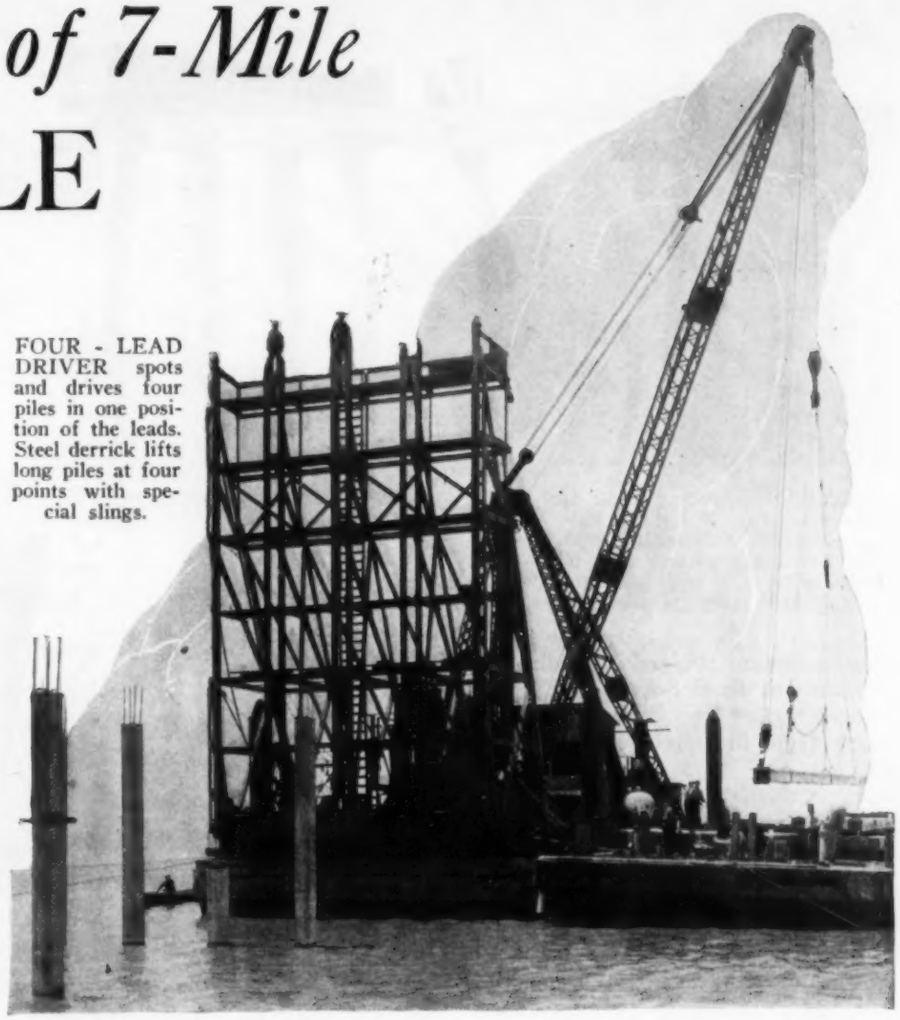


SEVEN MILES of concrete highway trestle precast, transported, and placed in 14 months establishes a new speed record for this type of construction.



PRECAST SLABS, placed in pairs on the caps of pile bents, form the deck of the bridge. A 100-ton derrick lifts the slabs, which are supported temporarily on the caps by wood blocks placed outside the danger zone indicated on the ends of the slabs.

Fabrication of 7-Mile TRESTLE



FOUR - LEAD DRIVER spots and drives four piles in one position of the leads. Steel derrick lifts long piles at four points with special slings.

About 800 cu.yd. of aggregate was kept in storage piles nearby to avoid any plant tie-up. Two 1-yd. mixers in each plant prepared the concrete, which was distributed from the hoppers to the forms in hand buggies.

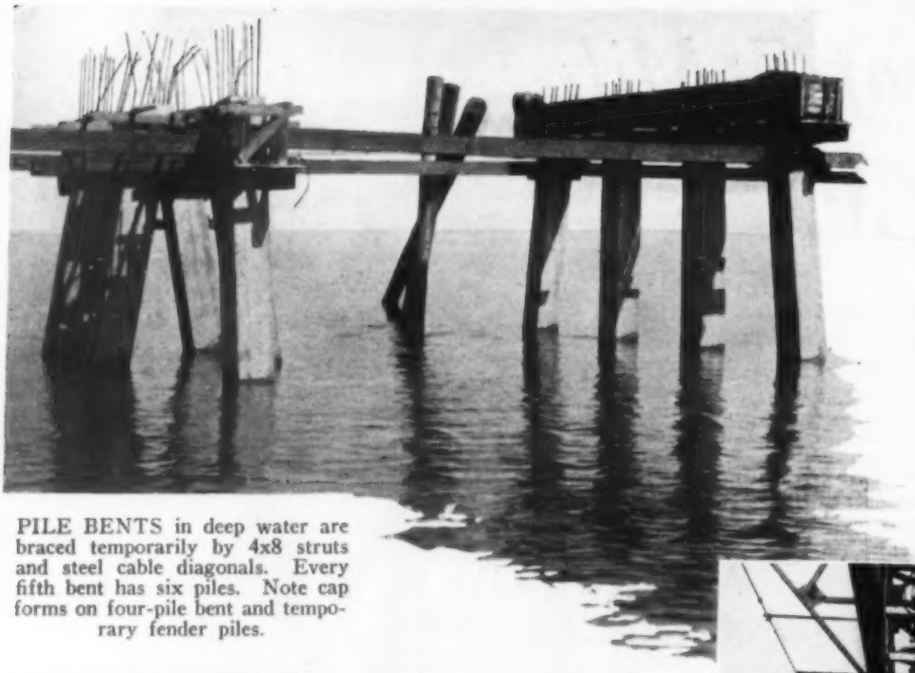
Slab Casting Yard—The 70x1,528-ft. slab platform was divided into 84 bays for the 30-ft. slabs and fifteen bays for the 35-ft. slabs. Forms were set side by side, two to each bay, just as the slabs later were to be placed on the bridge. The two slabs were poured as a unit, a longitudinal ¼-in. plate separating them. Short slabs weighed 46 tons and long slabs 55 tons each.

A 75-ton traveling gantry crane with an 85-ft. span lifted the slabs from the forms and deposited them on the barges for delivery to the bridge. The crane carried a structural steel lifting frame about the same size as the slab. At each corner of this frame a flat hook was suspended from a sliding support. The position of the hooks could be adjusted for the different slab lengths.

The slabs were so designed that they could be lifted safely by hooks or jacks placed not more than 2 ft. from the inside face of the longitudinal beams. To indicate the danger zone under which it was not safe to place supports, a heavy red mark was painted over the central part of the ends of each slab.

A total of 51,000 cu.yd. of concrete was contained in the slabs. The mix was 1 : 2.8 : 4.11, containing 3 per cent of diatomaceous silica, with a water-cement ratio of 0.85. Because of the great length of the slab casting platform, two auxiliary hoppers were

CASTING YARD: 1, mixing plants and material bunkers; 2, locomotive cranes; 3, pile casting platform; 4, cement houses; 5, pile storage yard; 6, barge slip for loading piles; 7, cement unloading dock; 8, receiving yard for material cars; 9, casting shed for curb and railing; 10, barge slip for loading deck slabs; 11, slab casting platform; 12, conveyor inclines to auxiliary concrete hoppers of slab casting yard.



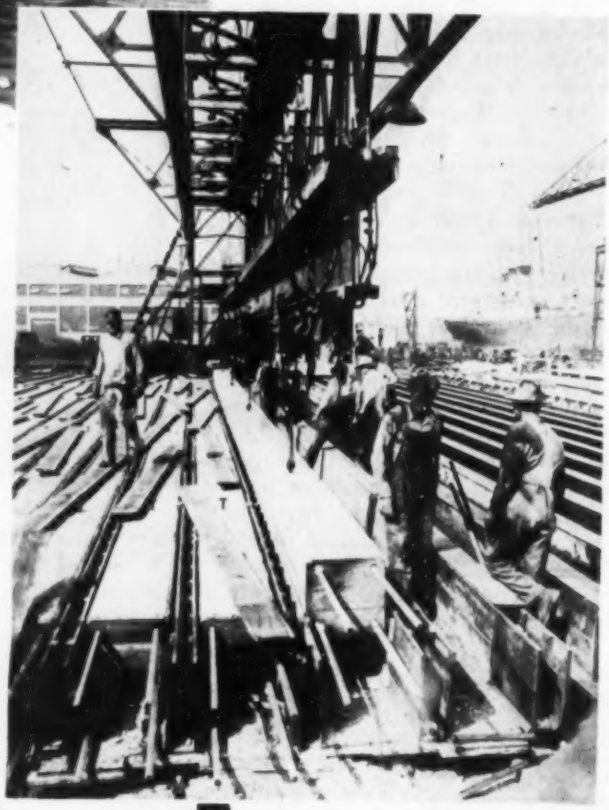
PILE BENTS in deep water are braced temporarily by 4x8 struts and steel cable diagonals. Every fifth bent has six piles. Note cap forms on four-pile bent and temporary fender piles.

placed toward the ends to reduce the distance of hand delivery. Cable-operated hopper cars conveyed the concrete from the mixing plant to these hoppers.

Pile Casting Yard—Operations in the pile casting yard were arranged to advance progressively down the length of the yard. Moving toward the bay, the sequence of units was steel yard, pile casting platform, pile storage yard, and barge slip. A 50-ton gantry of 125-ft. span on a 1,200-ft. runway covered all this area.

Pile forms consisted of two side panels nailed to the platform. Side panels of adjoining piles were held in place at the top by spreader boards which covered the narrow alley between the piles. These boards were cleated to hold the tops of the side panels, and the edges, which projected over the side panel, were beveled to form the rounded corners of the piles.

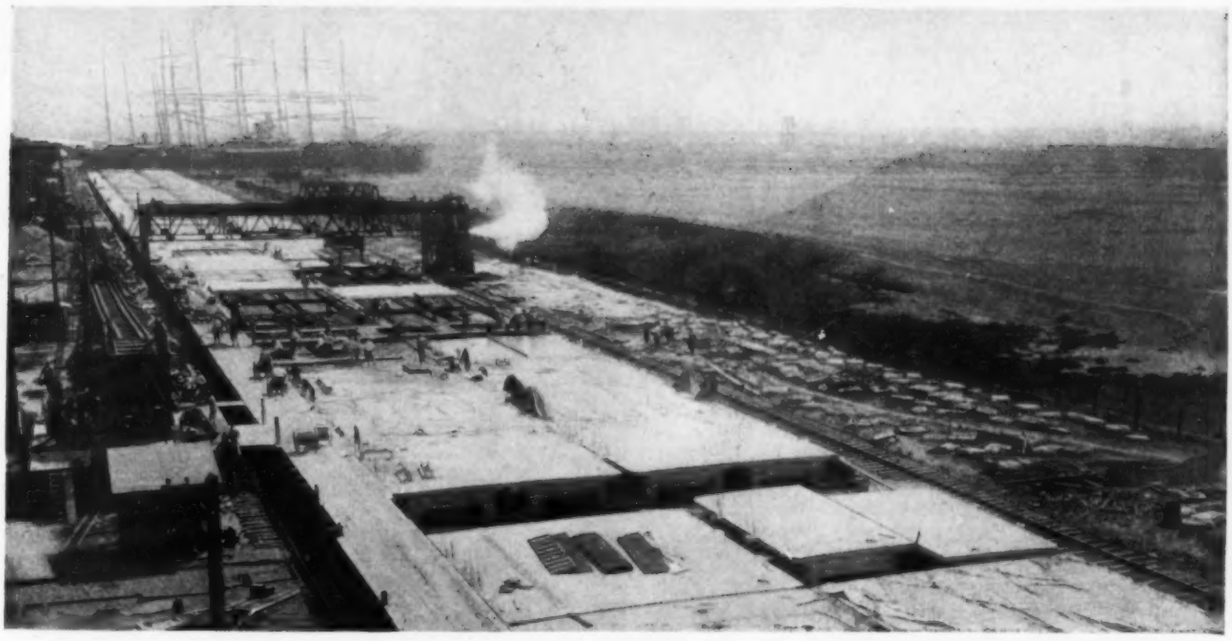
With proper care, the side panels lasted for 30 pours; but the beveled cover boards, with their sharp edges, had to be replaced after serving four times. The concrete mix for the piles was 1:2.08:2.8, containing 2 per cent of diatomaceous silica, with a water-cement ratio of 0.65. Approximately 26,200 yd. of concrete was required for the 5,000 piles. About 3,300, of lengths from 45 to 65 ft., were 16 in. square. The remaining piles were 18 and 24 in. square. A special size for 94 batter piles was 20x26 in. The maximum



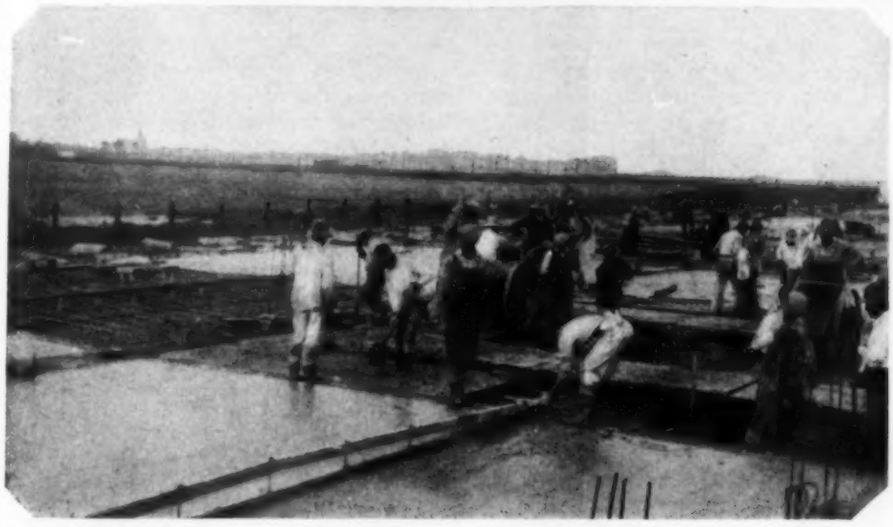
PILES (*right*) are lifted from the forms after 7 days and usually go to the driver at the end of 28 days. Forms consist of side panels nailed to platform and held at top by cover boards.

SACKED CEMENT is unloaded from barges by traveling derrick and is hauled to storage houses over narrow-gage railway.

TWO 1-YD. MIXERS (*below*) at each plant produce concrete.



SLAB CASTING YARD is traversed by 75-ton gantry crane, with 85-ft. span, which lifts slabs from the forms and carries them to barges at the far end of its runway.



FINISHING TEMPLET for concrete slabs consists of a 1x6 cedar board on the flat, stiffened by cedar 2x4 and supported by arched truss of 2x4's and ½-in. bolts.

length of the 24-in. piles was 105 ft.

The traveling gantry crane picked up reinforcing cages two at a time in the steel fabricating yard and delivered them to the forms, lifted the piles from the forms to place them in the storage yard, and finally transported them from the storage yard to the barges. Up to 77 ft. in length, the piles were designed for three-point support, four-point pick-up being used for greater lengths. For handling by the gantry, 1-in. T-bolts were screwed into ½-in. plates, 6 in. square, embedded in the concrete. At the piledriver, slings placed at the T-bolt points lifted the pile from the barge. As long as the pile was in a horizontal position, it was kept right side up in conformity with the distribution of the reinforcing steel.

As floating equipment was to be used in driving the piles and placing the deck slabs, it was necessary to prepare a navigable channel parallel with the bridge through the shoal water on both sides of the bay. Dredges moved 1,400,000 yd. of material in preparing this channel.

Driving Piles—A four-lead driver equipped with a steel stiff-leg derrick and two steam hammers drove the piles for the bents. The derrick handled the hammers and lifted the piles from the barge into place in the leads. As each pile was turned from the horizontal to the vertical, the load was transferred from the slings to a line attached to a shackle on a special plate clamped to the four reinforcing rods projecting from the butt end of the pile. This line was not removed until the pile had been allowed to sink to place, ready for the hammer. An instrument man lined each pile with the transit when it was put in the leads before being allowed to drop and again before driving commenced. The piledriver leads were so mounted that they could be moved on the barge in two directions by steam engines which gave fine control over the movements and aided speedy adjustment to exact position. More than 5,000 piles were

BURLAP AND SPRINKLERS keep the concrete of both slabs and piles wet for the curing period. Slabs are moved from forms to barges at end of 11 days.

driven in 7 months. The hammers struck a 5,000-lb. blow and had a 36-in. stroke.

Piles were cast in lengths to approximate the requirement at assigned locations, with bars projecting from the top to make a bond with the cap. When penetration was less than 1 ft. under 70 blows, driving was stopped, and that part of the pile above grade was cut away. If a pile drove at more than ½-in. per blow after it was down to grade, it was pulled and a longer one was substituted.

Placing Slabs—Caps were poured from a floating plant in forms bolted to the four piles of a bent. A 100-ton derrick barge placed the slabs on these caps. Slabs first were placed on 12x12 wood blocks set on the caps outside the painted danger zone of the slab. Ball-bearing jacks took the weight from the blocks and shifted the slabs to exact position as determined by a transit. Screw jacks then were used to carry the load for 7 days until supporting concrete freshly cast beneath the longitudinal arch beams had hardened.

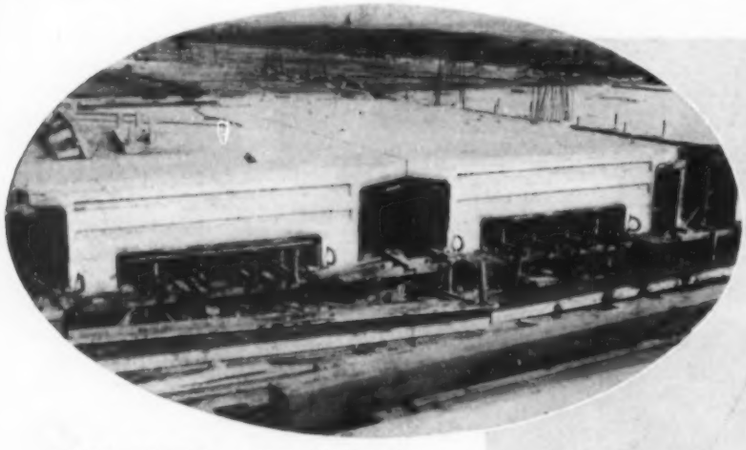
A 10-in. space was left between adjacent slabs at each bent. Two loops of reinforcing steel from each slab projected into this opening. Steel from the cap, also, extended upward into the gap. With additional bars inserted as a tie, concrete poured into the opening bound all parts firmly together.

Communication—A radio telephone communication system greatly aided co-ordination of production and erection operations. By advance notice of barge arrivals, men at the slab yard knew when to lift slabs from the forms. As there was no storage space at this yard, slabs had to be left in the forms until a barge was ready to take them.

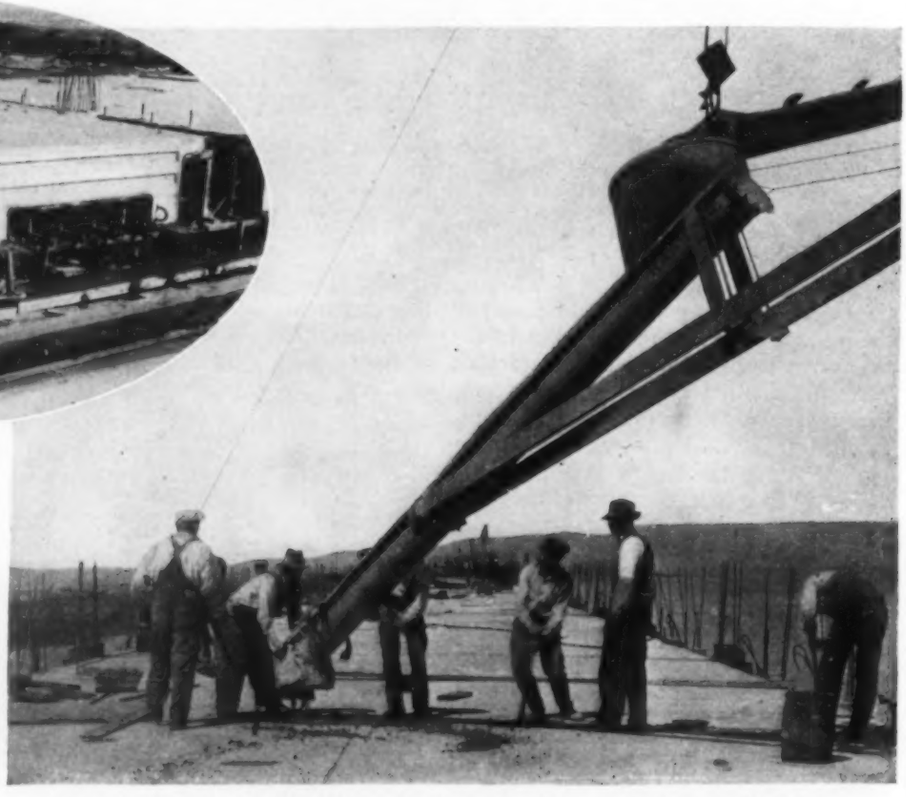
Adverse Conditions—Wind and tide conditions for months in San Francisco Bay forced restriction of the working period to the hours between 4 and 9 a.m. In spite of this adverse condition, the contractor obtained perfect alignment and a smooth riding surface, while breaking all records for speed.

For the Raymond Concrete Pile Company, O. C. Struthers, Pacific Coast district manager, R. A. McMenimen, works manager, James V. Brannigan, superintendent on the bridge, T. V. Moore, assistant to the works manager, and W. X. Hull, superintendent of the casting yard, contributed, in their various directing capacities, to the speedy progress of the work. The consulting engineers in charge for the San Francisco Bay Toll Bridge Company were Waddell & Hardesty, New York City, represented on the job by A. W. Deuel, resident engineer, and F. A. Savage and C. P. Moss, field engineers. Piers for five steel channel spans were built by the Foundation Company, and the Virginia Bridge & Iron Company erected the steel, both companies acting under subcontract.

STEEL FRAME of about same dimensions as slab, with flat corner hooks suspended from sliding supports on which they can be moved to conform to different slab lengths, lift the deck slabs from the forms. Broad red stripe painted on end of slab marks area under which it is unsafe to place supports.



DECK SLABS are cast side by side just as they later will be placed on the bridge. Projecting loops of reinforcing are to form joint ties.



GAP BETWEEN SLABS, 10 in. wide, is closed with concrete from floating plant. Projecting steel from slabs and cap of bent, with additional steel inserted in the joint, ties all units together.

TRACTOR TRUCK AND TWO TRAILERS
Transport 100-Ft. Plate Girders

A LINN tractor truck and two four-wheel trailers solved for Owen P. Williams, Oneonta, N. Y., contractor, the problem of moving two 100-ft. plate girders from the railroad to the site of a bridge which he was building for the state highway department. He unloaded each girder on to the two four-wheel trucks. The tractor truck then hauled the girder in 20 minutes to the bridge site, where it was skidded to place on the abutments by means of inclined rails supported on timber cribbing.

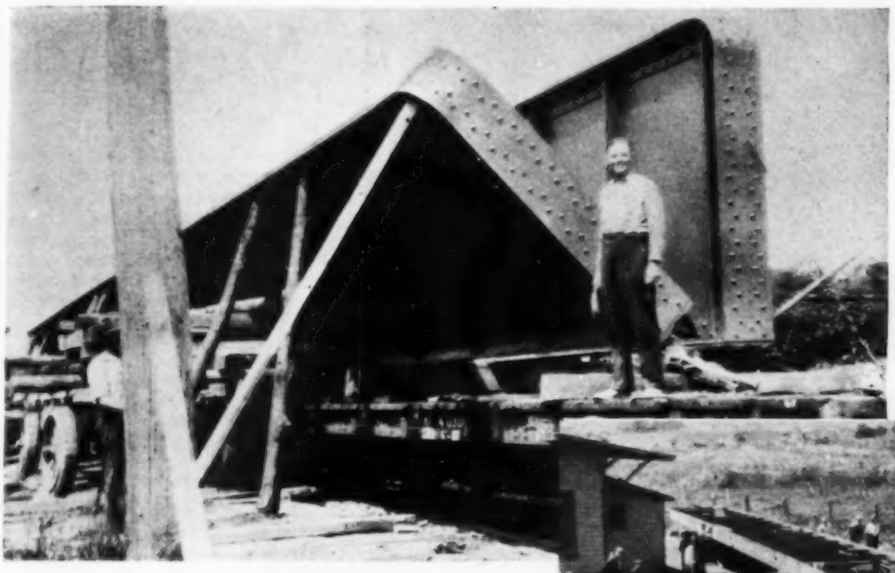
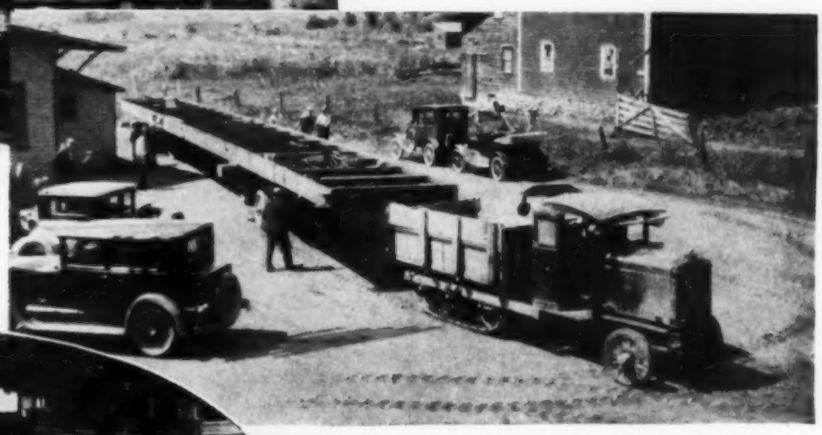
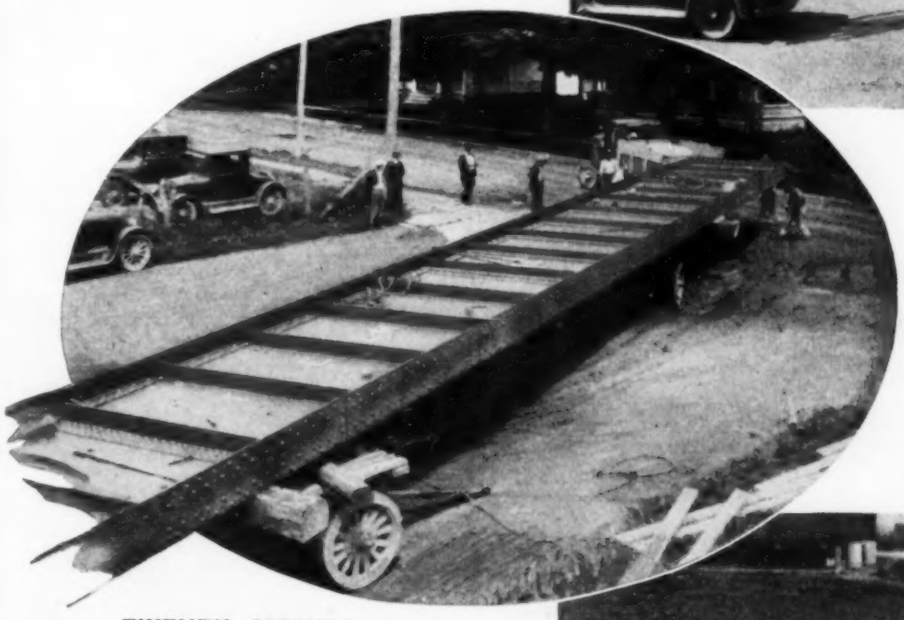


PLATE GIRDERS, 100 ft. long, are unloaded from railroad flat cars on to the two four-wheel trailers.



A TRACTOR TRUCK hauls the girder from the railroad to the bridge site.

Photographs and data from
CHARLES T. FISHER
Engineer for
Owen P. Williams, General Contractor,
Oneonta, N. Y.



TWENTY MINUTES (*above*) suffice to make the ½-mile trip without difficulty.

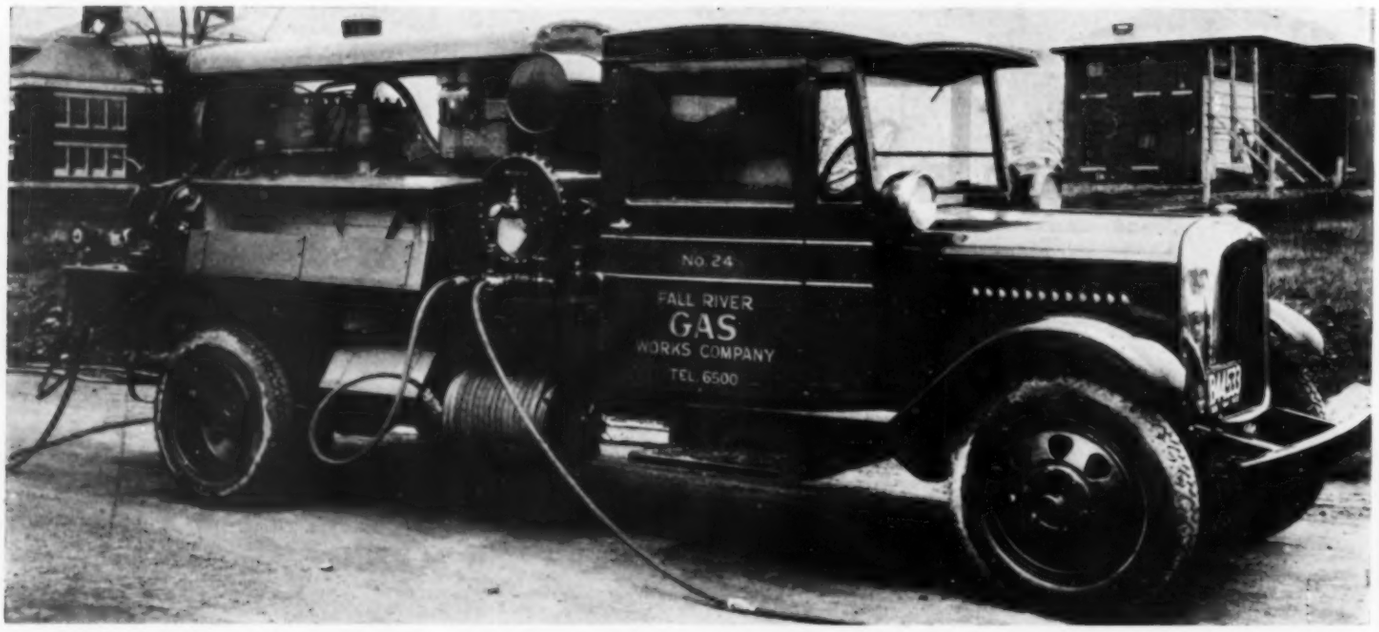
INCLINED SKIDS (*right*) supported on timber falsework are used in raising the girder to the abutments of the bridge.

Getting Down to Close-up Job Methods

CHIP SPREADER (*below*) of the Oregon State Highway Department scatters sand and gravel evenly over the surface of freshly oiled roads. Two disks mounted at the rear of a motor truck are rotated by chain drive from sprockets on the rear wheels. These disks catch the material as it flows to them through spouts from the body of the truck and cast it across the width of the highway.

©*Underwood & Underwood*

FLY SCREEN (*above*) woven into welded wire 4-in. mesh is backing up the Gunite for the end wall of this monitor on an Atlanta, Ga., factory building. The Rust Engineering Co., Pittsburgh, makes the 2-in. wall by blowing a 1¾-in. layer onto the front of the fly screen, which is reinforced behind by ¾-in. rods spaced about 1 ft. apart. Sufficient coating then is put on in back to cover the reinforcing rods.



AN ALL-PURPOSE COMPRESSOR. This Ingersoll-Rand unit on a GMC truck serves distribution department of gas company in drilling, pavement breaking, loosening earth, tunnelling, tamping, calking pipe joints and cutting cast-iron pipe.

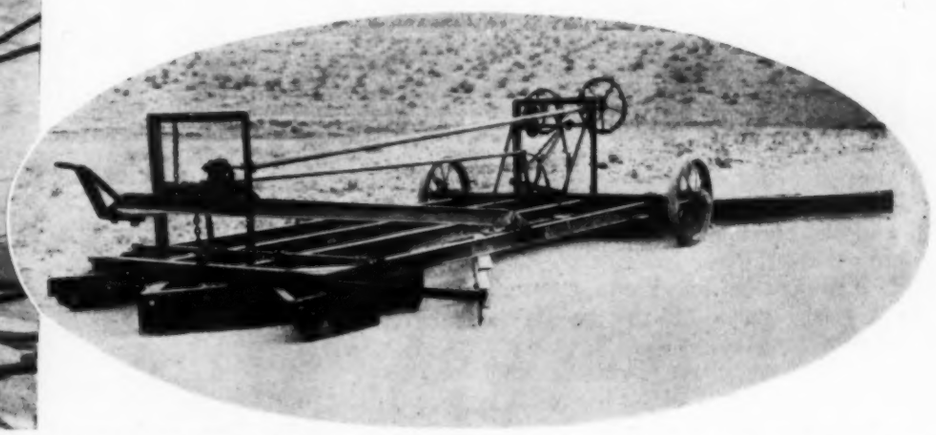
Photo from **G. M. Robinson,** *Fall River Gas Works Co., Fall River, Mass.*

DETAILS
Shots of and Equipment

How about mailing the Editor of *Construction Methods* an interesting detail from *your* job?

SELF-LOADING BRICK MOVER (*right*) saves time and labor in the yards of the Brea Brick Co., Los Angeles. A lifting mechanism operated by the power take-off raises and lowers the load-carrying table attached to the front of a McCormick-Deering tractor. The table in the lowered position can run freely in and out under the specially constructed stands on which the bricks are piled.

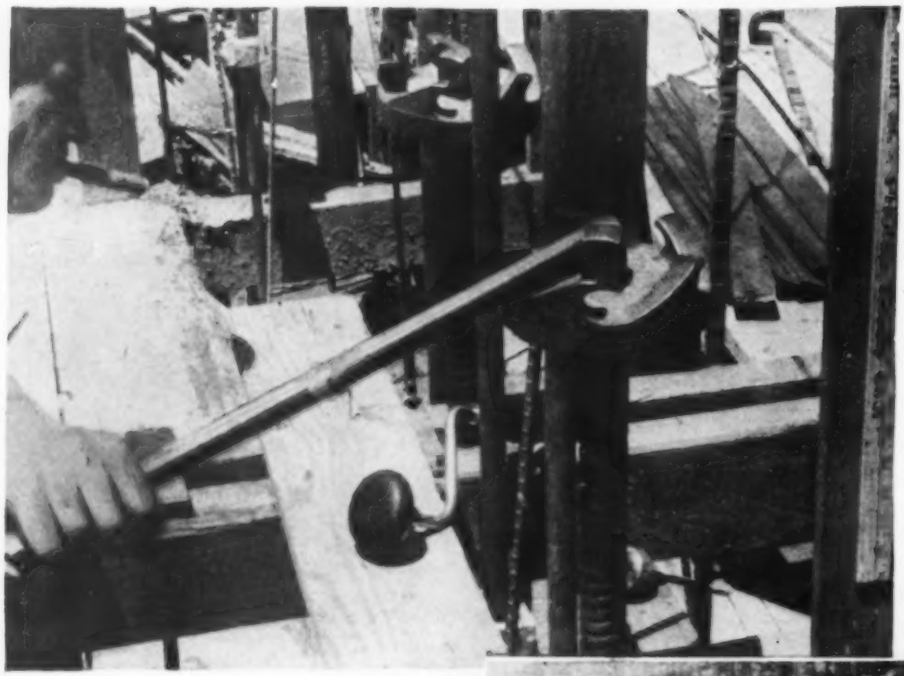
UNDERWATER CUTTING TORCH has graphite electrode pierced by two small holes for oxygen. Diver draws arc by touching end of torch against steel piling or other metal under water. Photo from Linde Air Products Co.



HIGH SPEED MAINTAINER designed for the New Mexico State Highway Department by Col. H. R. Andrew of the Spring & Forging Company, Roswell, N. M., weighs only 2,100 lb. and permits blading with a small truck at the rate of 8 to 15 miles an hour. Blades are set at an acute angle; their width, out to out, is 11 ft. 6 in. Stabilizer blades placed parallel to the center line of the road, one at each front corner and one in the center of the rear of the machine, respond instantly to the operator's foot levers and act to prevent any chatter, side sway, or vibration that may develop.

TO TRANSFER GIRDERS for the Sandusky Bay Bridge from shore to barge, the Mt. Vernon Bridge Co., of Mt. Vernon, Ohio, used the method which railroads employ in ferrying freight and passenger cars. Two wheeled trucks traveling on narrow-gage track carried the girders from the pier on to the deck of the barge.

SLIP *of Concrete*



SPECIALLY DESIGNED HEAD of lead screw on lifting yoke makes an easy job of jacking up forms.

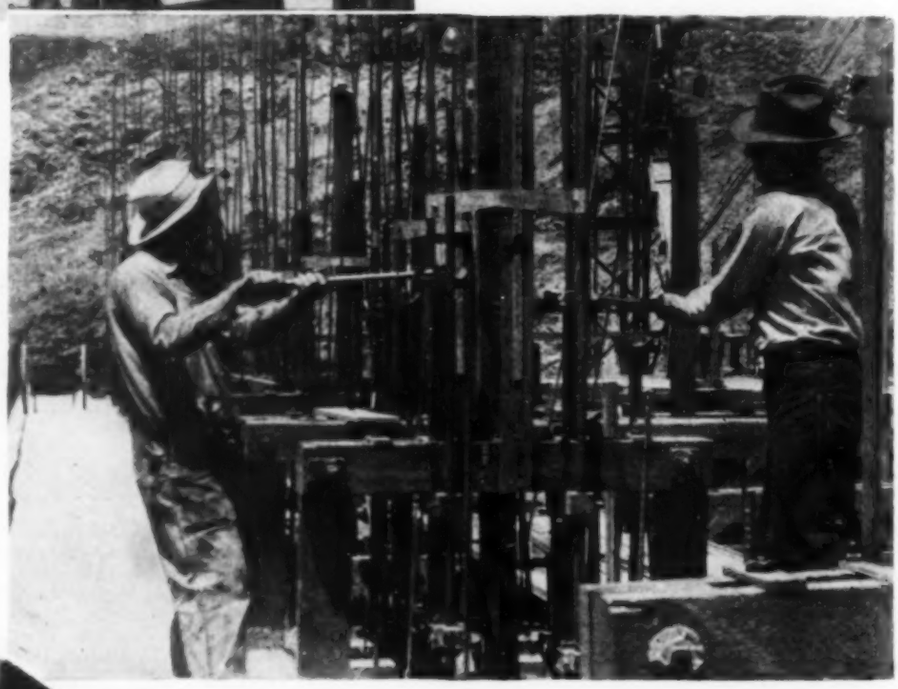
THE selection and use of the Keller slip form process for continuous placing of concrete enabled the Bureau of Power and Light of the City of Los Angeles, in nine 24-hour days, to pour the superstructure of the building at the San Francisquito Power Plant No. 2, the original building having been entirely swept away by the St. Francis Dam flood of March 13, 1928.

The slip form method was decided upon because the new power house had to be erected quickly preparatory to overhauling one of the generating units damaged by the flood. Adaptation of the process to a structure of this type was entirely new to the Bureau, although the method had been used previously on storage buildings of plain design with few openings and practically no steel frame work.

The power plant building, of reinforced concrete with structural steel members in the roof and certain walls and floors of the electrical bay, measured 86x126x61 ft. above the ground.

The first step was to prepare the foundation walls from which the old structure had been torn away. The sliding forms and the necessary platforms and auxiliary equipment next were constructed for the four outside walls and one longitudinal interior wall and placed on top of the reconstructed foundation wall. The forms consist of 4 ft. of tongue-and-groove wood forms placed on both sides of all walls to be poured. Attached to these forms, and on the level with the top of the form, are runway platforms with guard rails. Attached some distance below the forms are finishing platforms and a sprinkler system which continually plays small streams of water on the concrete as the forms rise. A lighting system makes possible 24-hour operation.

The method of lifting the forms consists of sets of two 1-in. high carbon steel rods placed at fixed intervals



JACK MEN (*above*), with ¾-in. bars, raise the individual stations from ¼ to ⅜ in. at a time.

LOWER END OF YOKE (*left*), showing wedge grip attached to high carbon steel rods which carry weight of all platforms.

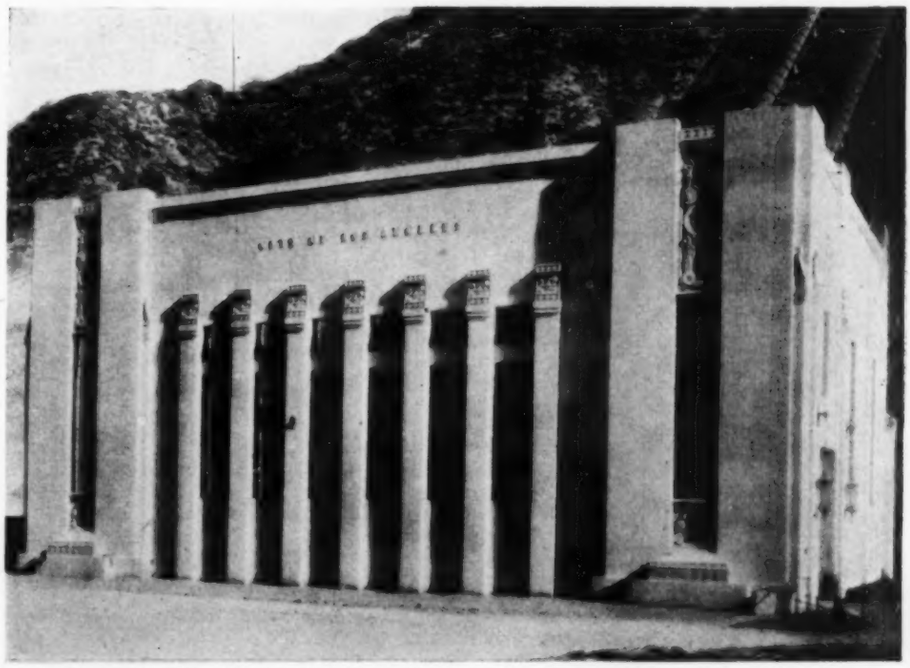
FORMS *Speed Construction* *Power House*

By CLAYTON M. ALLEN
Junior Electrical Engineer,
Bureau of Power and Light,
Los Angeles, Calif.

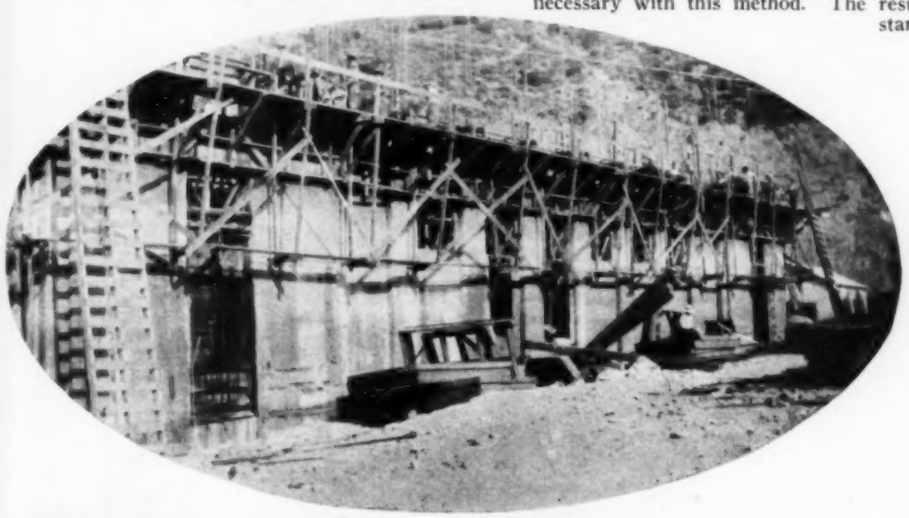
throughout the building walls and resting on the foundations. The entire load of forms, including the platforms, is carried by special lifting yokes with an approximate take-up of 36 in. which are clamped to the steel rods by means of a movable wedge grip. A specially designed head on the lead screw of the yoke enables the workmen, by the use of a $\frac{3}{4}$-in. bar, readily to turn this lead screw and jack up the forms at a rate of about 3 in. per hour.

The concrete was prepared in a $\frac{3}{4}$-yd. Davis mixer operated by an electric motor at ground level and was raised by a steel tower hoist to a hopper which dumped into five two-wheel hand-driven concrete buggies. The concrete workability was increased by adding 2 lb. of crystalline talc per sack of cement.

SLIP FORMS *(below)*, with finishing platforms and sprinkler system attached, make steady progress upward.

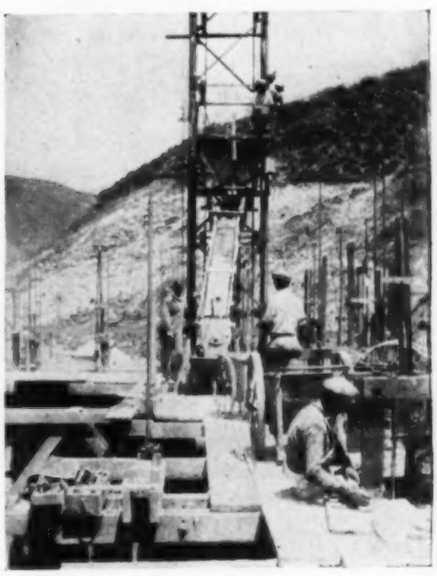


DESIGN OF POWER HOUSE was altered slightly to create vertical lines necessary with this method. The result is most pleasing from an architectural standpoint.



low the form to pass the beams were taken out of the inside wall of the form and were replaced when the bottom of the form cleared the top of the beams. The ordinary method was used for blocking out the openings for the doors and windows and for building the fire wall.

STEEL TOWER HOIST *(below)* raised concrete from mixer at ground level and delivered it to hand buggies.

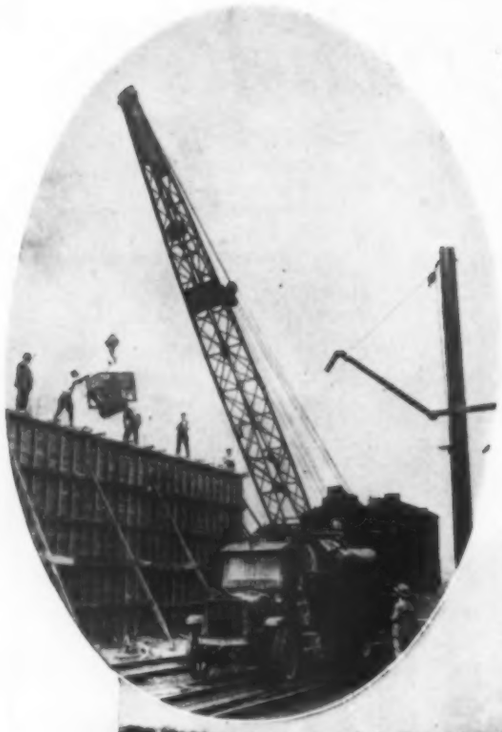


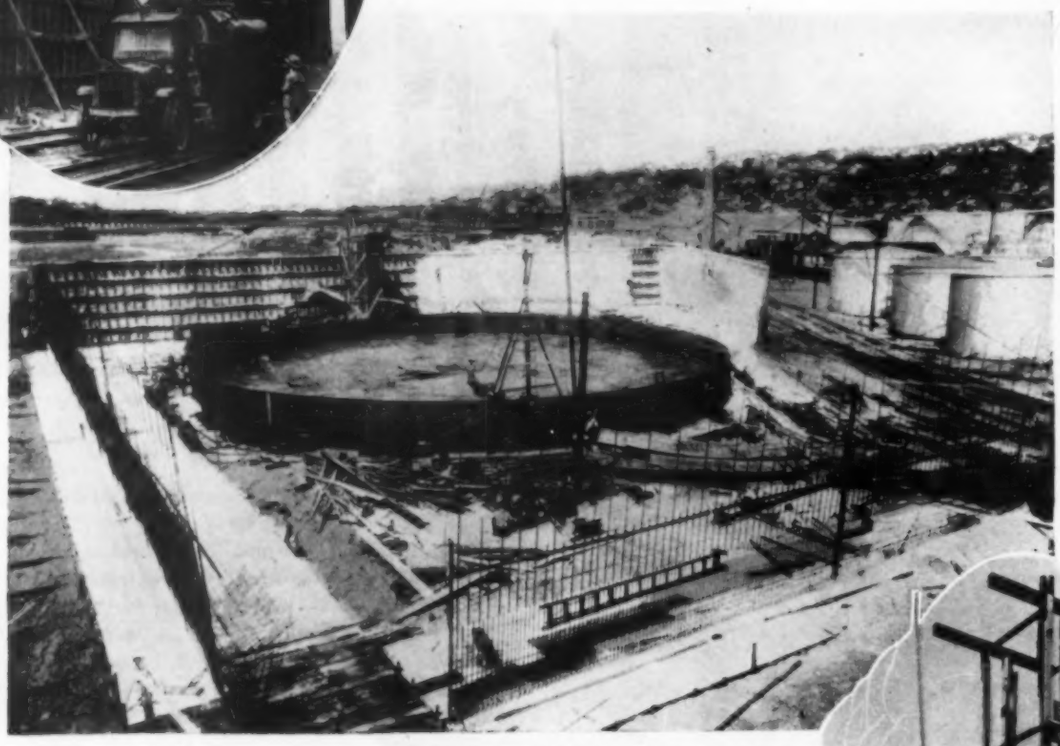
Each 12-hr. shift consisted of five buggy men, six jack men, and four tamping men. The mixer turned out a batch every three minutes. Each buggy man made a trip every three minutes and traveled approximately 10 miles in the 12-hr. shift—a good day's work without pushing a concrete buggy.

As the forms passed the structural steel floor beams on the second and third floors, pieces wide enough to al-

SETTING SLIP FORMS *(left)* on foundation walls. Reinforcing steel in place.

Workable
READY-MIXED CONCRETE
Cuts Labor Cost on Fire Wall





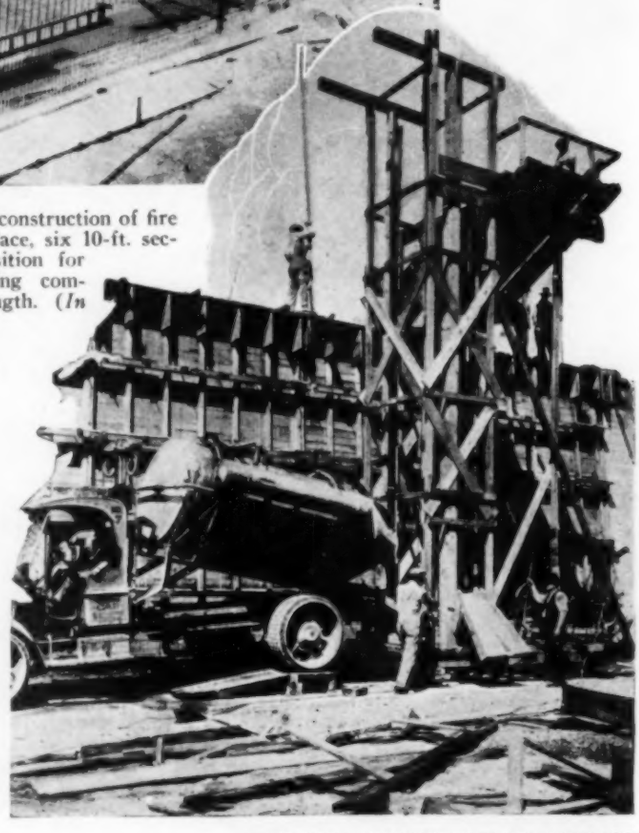
A SUBSTANTIAL saving in labor and time was made recently by the J. W. Feak Co., at Seattle, Wash., by the use of ready-mixed concrete in the construction for the Richfield Oil Co. of a fire wall around a large storage tank erected on a hydraulic fill. The job was completed in 18 days.

To prevent tipping and reduce tendency to settle, H. P. Lohrer, general superintendent for the contractors, first put down a concrete footing 18 in. thick and 17 ft. wide, using a 1:2¼:3¾ mix with 7 lb. of Celite to each cubic yard of concrete.

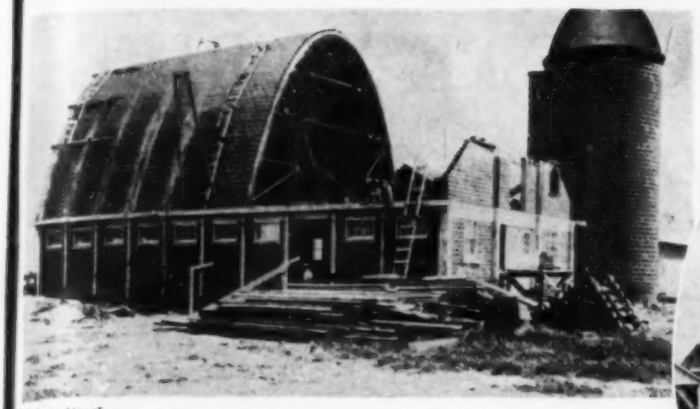
The wall was 20 ft. high, 2 ft. 4 in. thick at the bottom and tapered to 7 in. Approximately 100 lb. of steel per yard of concrete was placed. Sectional forms were used, 60 ft. of wall being poured every other day. The forms in most cases were removed without difficulty in less than 24 hours. The mix was 1:2:4, with 16 lb. of Celite to each cubic yard. With this workable concrete, placed with a slump of 6½ in., only three men were needed to rod 60 ft. of wall.

The Phillips Sand and Gravel Co. and the Pioneer Sand & Gravel Co. supplied the ready-mixed concrete. It was hoisted up a tower and dumped directly into the wall. Satisfactory strengths were obtained with the mixes used, the 28-day average being 2,557 lb. for the footing and 2,650 lb. for the walls.

THREE STAGES in construction of fire wall—reinforcing in place, six 10-ft. sections of forms in position for pouring, and concreting completed on one 60-ft. length. (*In Oval*). TRAVELING CRANE makes satisfactory substitute for tower on one day's pour.



READY-MIXED CONCRETE (*right*) unloaded from truck mixers was elevated by tower and poured directly into the forms. A total of 1600 cu.yd. was placed in footing and walls.

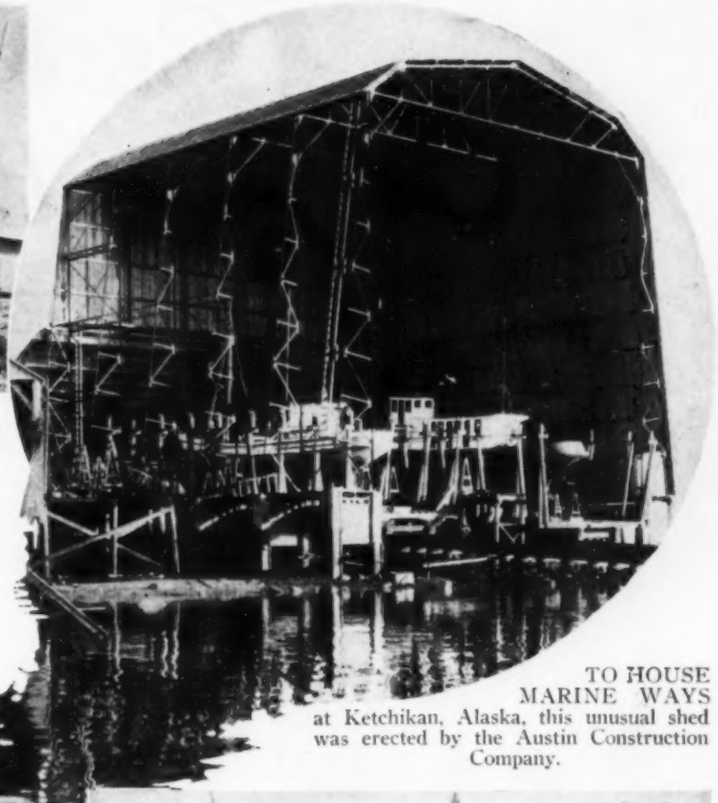


International

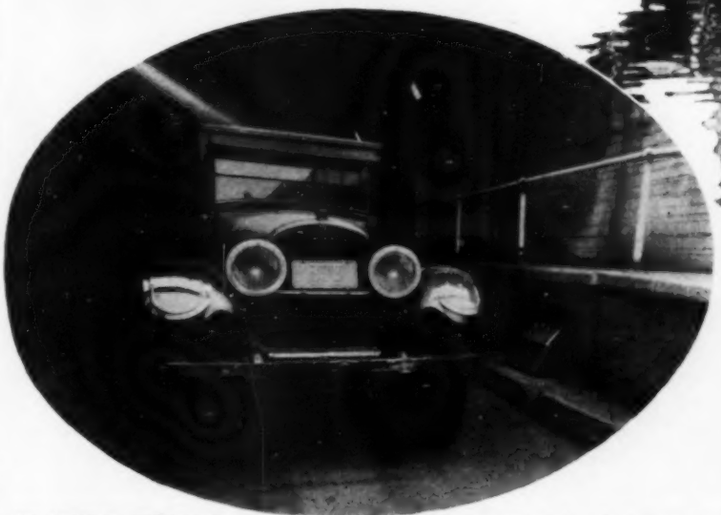
MASONRY ARCH BARN developed at Iowa State College is durable, fireproof structure with catenary arch roof reinforced by concrete ribs placed 6½ ft. apart along its length.

JOB ODDITIES

A Monthly Page of Unusual Features of Construction



TO HOUSE MARINE WAYS at Ketchikan, Alaska, this unusual shed was erected by the Austin Construction Company.

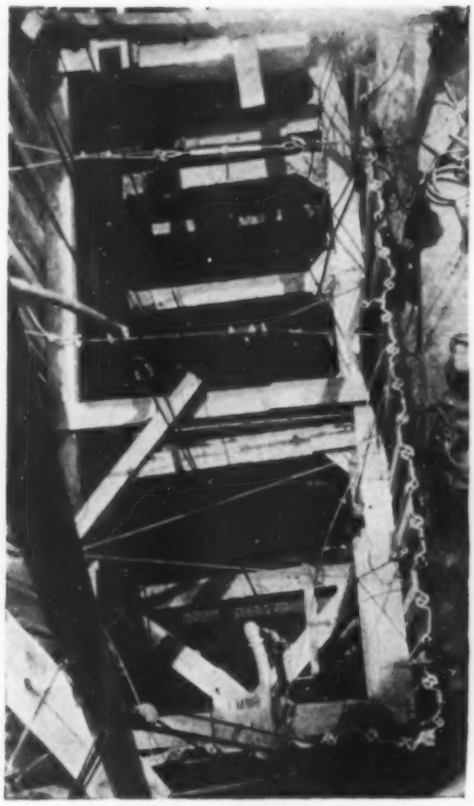


TRAFFIC CHECKER installed by the General Electric Company in Holland Tunnel is actuated by vehicle's intercepting light ray which shines on photoelectric tube at right.

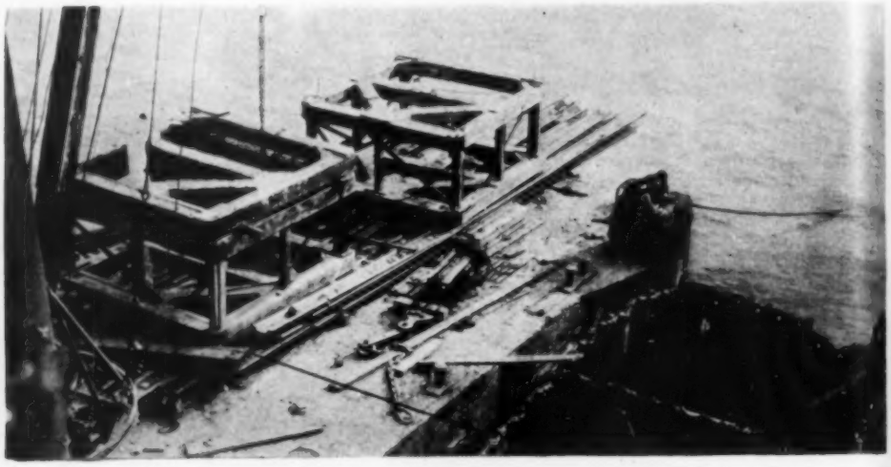
CONSTRUCTION BARRICADE, containing small shops, earns revenue for Berlin company while new building is being erected.

TOWER OFFICE on Detroit River bridge is engineers' secondary base. McClintic-Marshall Co., contractor.

CONCRETE STRUTS *Permit Continuous*



CONCRETE STRUTS in the bracing frames make it possible to erect the forms and pour the pier to the top without stopping to remove timbers.



FRAMES of 12x12 timber wales and 12x12-in. concrete struts are made up ready to be placed in the three equal sections of the cofferdam.

HIGH seas, battering the steel walls of the Sandusky Bay Bridge cofferdams, forced the contractor to rush pier construction inside the heavily braced structures. On the first of the two cofferdams for the lift span piers, Superintendent R. E. Colvin, in charge for the contractor, A. Bentley & Sons Co., Toledo, Ohio, was beleagured by heavy seas and the rapid approach of winter. Some method had to be devised to finish the pier before frigid weather and unruly waves combined to drive the crew to cover. The cofferdam could not be expected to last out the winter.

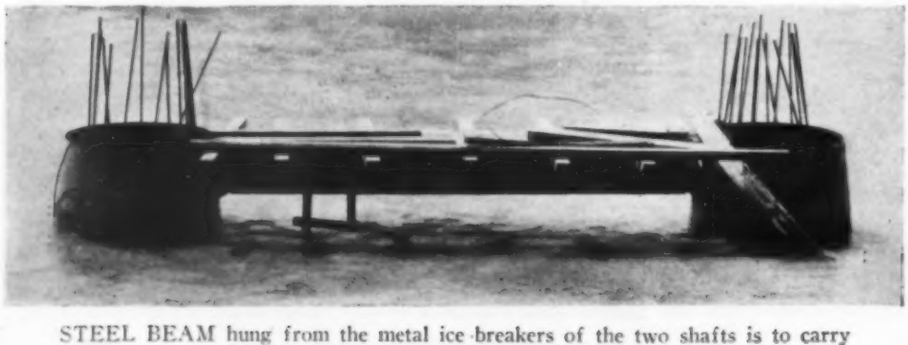
By replacing the timber struts inside the cofferdam with concrete, the builders were able to pour the pier from seal to above water level in one continuous operation and thus beat wind and weather. By spring, when he attacked the second pier, Mr. Colvin had prepared a more complete and effective plan based on the same principle of using concrete struts.

Design of Bridge—The Sandusky Bay Bridge is a structure 2,039 ft. long, comprising nineteen 100-ft. plate girder spans and one 65-ft. lift span. It provides a shorter highway route between the cities of Cleveland and Toledo, Ohio. As the bay is only 7 to 10 ft. deep and is exposed for 18 miles west of the bridge to the full effect of prevailing westerly winds, construction had to proceed in the midst of choppy waves which frequently rose to serious proportions. Normal bay level is at El. 570. Hard limestone lies at depths varying from El. 520 to El. 546. Supporting the nineteen 100-ft. spans and the two 30-ft. end spans of the bridge are 21 typical piers consisting of two round concrete shafts surmounted by a concrete cap.

The footing of the lift span piers is 12x45 ft. in area; but, because waves 4 to 6 ft. high might move the cofferdam, the contractor made it 13x46 ft. in plan. During November, 1927, a very stormy month, the first dam was set, pumped out, excavated, and timbered as the excavation went down. On account of the heavy seas, the cofferdam required a tremendous amount of timbering, which practically filled it by the time excavation had been carried to rock. Under these conditions, it would have been necessary to pour the pier in 4-ft. lifts, and the shortness of the season made it unlikely that the structure could be completed by such a slow process.

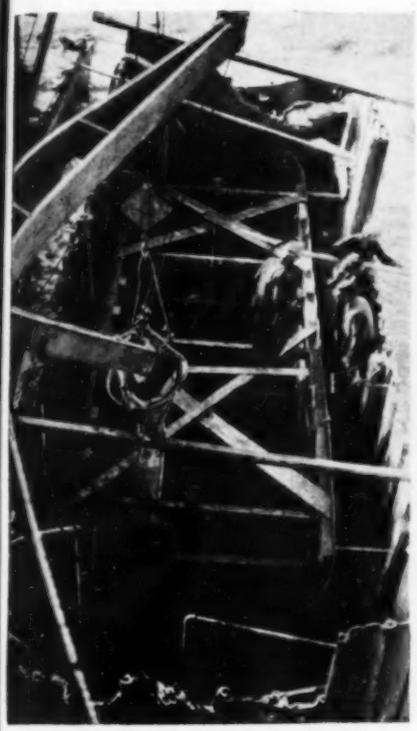
Mr. Colvin expedited matters by replacing the timber struts with concrete and by forming and pouring continuously the 9x38-ft. shaft of the pier from the concrete seal to above water level. Timber wales already were in place spaced 4 ft. vertically, the frames being spread apart by vertical struts and tied together with wire cable. The whole cage of timbering was held down by blocks from bolts through the pulling holes of the piles.

Placing Concrete Struts — Using Lumnite cement for quick development of high strength, the cofferdam crew cast 12x12-in. concrete struts between the 12x12 timber struts. The concrete struts had typical column rein-



STEEL BEAM hung from the metal ice-breakers of the two shafts is to carry the wood form for the cap of this typical pier.

INSIDE COFFERDAMS
Pouring of Piers



CONTINUOUS PLACING of concrete starts as soon as the forms and steel ice breaker have been set.

The form system which A. Bentley & Sons Co. developed for placing the concrete deck on steel spans of the Sandusky Bay Bridge is fully illustrated by the Step-by-Step story on pp. 40 and 41.

forcing and splayed ends to give greater bearing against the 12x12 wales. Wood struts were removed at the end of 28 hours, the shaft was formed from the concrete seal to the steel plate ice breaker, and the ice breaker was set in place. The pier then was poured to above water level in one continuous operation.

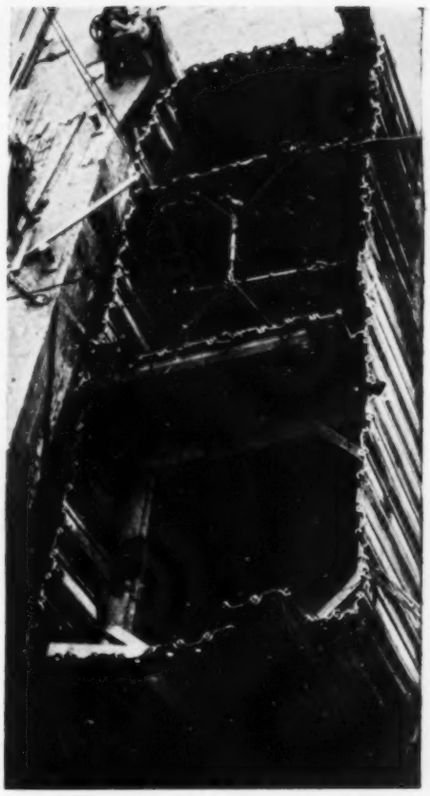
A much improved method of bracing the second cofferdam was ready for trial in the spring. The dam was constructed in three equal sections, with the interior piling partitions joined by means of T-piles to the outside walls, as one of the photographs shows. Mr. Colvin drove the center section first with a T-pile at each corner, and then set the end sections, making three dams of identical dimensions.

Ready-Made Bracing Frames—Frames of 12x12 wales and concrete struts to fit the sections had been made up on shore previously. After excavating the center section, the contractor removed the temporary wales by which the piling had been set and lowered the ready-made bracing frames into the well with block and tackle. Finally, the temporary wales were put back at the top. The center section then was pulled together at the top with cables and steamboat ratchets, a diver cleaned off the bottom, and a concrete seal was placed by tremie.

The contractor treated the two end sections in the same manner, and, after sealing them, pulled the interior piling partitions. The temporary frames at the top of the three sections were removed, and wales the full length of the dam were placed about 1 ft. below the ice breaker. After building the shaft form and setting the ice breaker, the crew poured continuously on the seal to above water level.

Typical Piers—Circular cofferdams of 26 14-in. Lackawanna arched web 40-lb. steel sheet piling, put down with McKiernan-Terry 7 and 9-B hammers hung from 65-ft. booms, served for construction of the shafts on the other piers. A 20-ft. jib spliced to the boom increased its length that amount for setting the piles. The 26-pile dam gave a slightly greater diameter than the 8 ft. 6 in. required by the footing design.

To be sure of the character of the rock under the first eighteen shafts, as well as under the first lift span pier before described, the cofferdams of these piers were unwatered and the concrete seal was placed in the dry. The rest of the piers were constructed by cleaning off the rock with a diver and placing a 6-ft. seal by tremie before pumping out the dam. Pulsometer pumps and steam siphons were used to unwater the dams.

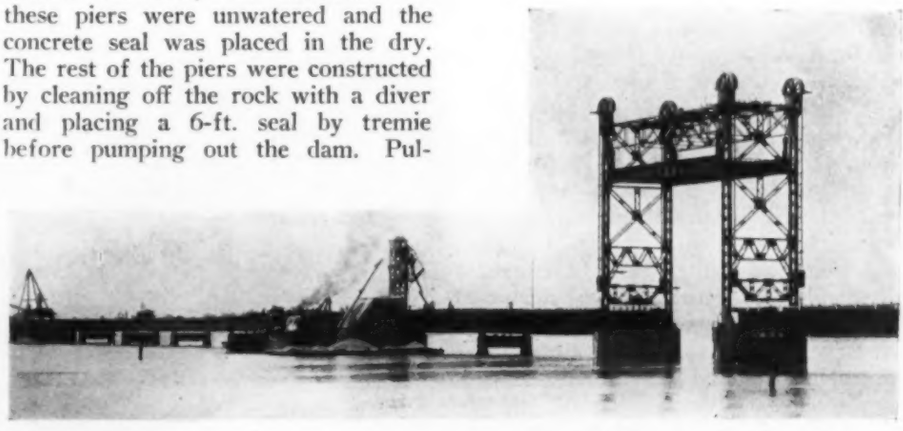


GREATER STABILITY is obtained by constructing the cofferdam in three sections and by excavating, bracing, and sealing them one at a time.

At the majority of the piers, 6 ft. of hardpan overlay the rock surface. The contractor spudded this layer with 12-in. H-beams, 35 ft. long.

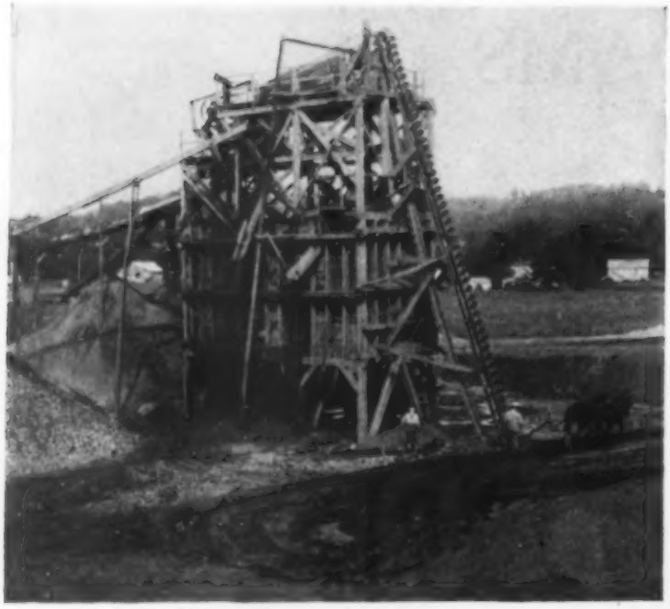
Circular forms, 6 ft. 6 in. in diameter, for the full height of the shaft, were built up on shore of 2x4 staves strapped with band iron. The forms flared at the top to receive the steel ice breaker, 6 ft. 10 in. high.

A. Gardner was in general charge for A. Bentley & Sons Co. Harrington, Howard & Ash, Kansas City, Mo., were the consulting engineers.



SANDUSKY BAY BRIDGE has 21 ordinary plate girder spans and one lift span. High seas in the shallow, exposed bay greatly increase the difficulty and danger of construction.

PIT AND *Combine to Produce Concrete*



SCREENING AND WASHING PLANT produces all the sand and one-third of the course aggregate.

TRUCKS haul from pit and quarry to fifteen stock pile locations, approximately ¼ mile apart.

A LIMESTONE quarry and a gravel pit along the right-of-way provided the aggregates for a 7½-mile section of concrete road completed by the Holmes Construction Company, of Wooster, Ohio, in October, 1928. The coarse aggregates were mixed in the ratio of two parts rock to one part gravel, as these were about the proportions in which the materials could be produced. Permission was granted by the Ohio Department of Highways to use the mixed coarse aggregate in the concrete.

The section in the Holmes Construction Company's contract was on State Route 76 between Coshocton and Millersburg. About 40 per cent of the distance was new location. The country was hilly, and in the 7½ miles were included 40 superelevated curves, of which seventeen, 5-degree or greater, were widened. The slab was 18 ft. wide, of 9-7-9 cross-section. A longitudinal center joint was formed with a crimped steel plate, and lateral expansion joints were placed 100 ft. apart.

Materials Supply—Millersburg and Coshocton were the nearest points from which aggregates could have been hauled to the job. A railroad runs parallel with the road, but a high hill between the two arteries forbids hauling from one to the other. The average haul from either town would have been 13 miles, making transportation costs very high. By fortunate coincidence, a sand and gravel deposit was available 500 ft. from the north end of the job, (marked *D* on the plan on p. 62) and a stratum of limestone was found along the right-of-way about 2 miles from the south end (*C* on the plan). Economy advised that the aggregates be produced from these two sources.

The sand and gravel pit could provide all the fine aggregate for the job but could furnish only one-third of the coarse aggregate required. When the situation was explained to officials of the State Department of Highways, they gave permission to mix crushed limestone with gravel to form the coarse aggregate.

Aggregate Storage—To minimize possibility of delay when paving operations would be started, aggregates were stored in stock piles at fifteen locations, approximately ½ mile apart, along the right-of-way. This distribution of materials meant a short trip for trucks hauling to the mixer and reduced the total number of trucks necessary. Stock piles were built up in advance by a small fleet of trucks hauling continuously. On the average, two were kept busy by each of the two plants producing aggregates.

Stock pile areas were selected from a viewpoint of drainage and accessibility of the piles of the three mate-

TWO-BATCH TRUCKS are charged with correct proportions of the three aggregates by volume hoppers on bucket loaders.

QUARRY *Aggregates for Road*

LIMESTONE QUARRY along the right-of-way provides two-thirds of the coarse aggregate. Location shown at *C* on plan (p. 62).

CRUSHING AND SCREENING PLANT prepares limestone aggregate. Power is supplied by 20-40 gasoline tractor.

rials. The sod was removed at the sites, and the ground was graded and rolled to obtain a smooth, hard surface from which bucket loaders could pick up the aggregates without loss of material.

Construction Schedule—The rock crushing plant began to operate about May 1, and the first gravel was hauled from the washing plant on June 21.

Trucks hauling north from the crushing plant had to climb a mile long hill on a 7 per cent grade at the point marked *B* on the location plan. To facilitate hauling from the quarry to the north end, Superintendent D. D. Mullett decided to grade and pave this hill first. Accordingly he started grading operations at *A* on May 7, working toward the south. By the time the mixer went into action at *A* on July 28, the grading equipment had finished its work from *A* to the south end of the job and had moved to the north end to resume operatons.

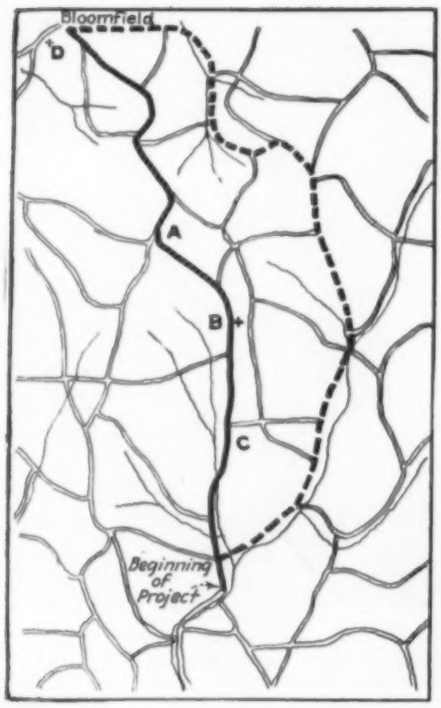
The paver laid slab continuously from *A* to the south end, with the exception of 1,100 ft. which had to be skipped where the quarry bi-sected the right-of-way. While the quarry and crushing plant were blocked in by paving operations to the north, a large quantity of crushed rock accumulated at the plant. This material had to be rehandled. Trucks began hauling north from the crushing plant on Aug. 23.

Quarry Operations—About 25,000 tons of crushed rock were required for the job. The limestone was a very hard, non-crystalline blue rock of the highest grade. It occurred in blocks from 30 in. to 5 ft. thick and from 40 to 50 sq.ft. in area. Wide mud seams separated the blocks. No drilling was done, all blasting being accomplished by placing the explosive in the seams or underneath the blocks. Many large stones were removed from the right-of-way itself.

Stripping for both quarry and gravel pit was performed by a Massillon 1¼-yd. shovel. The limestone lay under 10 or 15 ft. of earth. Overburden at the gravel pit was about 4 ft. thick. The equipment list gives essential facts regarding machinery used at the two plants. A force of 27 men, including two foremen, at the quarry and crushing plant produced an average of 150 tons a day. A three-man crew operated the washing and screening plant.

Grading—The grading crew consisted only of a foreman and one man in addition to the operators of the Lorain 75 shovel, the four Hughes-Keenan iron mules, the Galion grader, and the Galion roller. This outfit moved 700 to 800 yd. a day. In general, hauls varied from 200 to 500 ft. On one haul of 2,100 ft., trucks were added to help dispose of the spoil. About 6,500 yd. of sandstone had to

ROSS E. HAMILTON (*left*), resident engineer, Ohio Department of Highways, and D. D. MULLETT, superintendent for the Holmes Construction Company.



LOCATION PLAN. Grading and paving start at *A*, working toward southern end. Broken line indicates route followed over county roads in hauling from one end of the job to the other.

be drilled and shot in grading the road.

Hand work on the fine grade was kept at a minimum by the use of a Carr formgrader for cutting the form trenches and of a Lakewood subgrader for trimming the subgrade.

Supplying the Mixer—Five or six two-batch trucks were kept busy hauling from the stock piles to the mixer. Because of the extra time required to load three aggregates instead of the usual two, an extra truck was needed to keep the mixer supplied. A Barber-Greene bucket loader was stationed at each stock pile. The hoppers of the loaders were adjusted to hold the correct volume measurement for each class of material: 14 cu.ft. of sand, 7 cu.ft. of gravel, and 14 cu.ft. of stone.

Cement was hauled from Coshocton by three trucks, the supply being replenished during the night. The seven sacks required for each batch were dumped in a double tarpaulin on top of the aggregates for transportation to the mixer. This double tarpaulin formed a waterproof container in conformity with the specifications.

Curing—The slab was covered with burlap kept wet for 24 hours and was cured with moist earth. At the end of 7 days, a beam test was made, and, if the modulus of rupture was as great as 500 lb. per square inch, light traffic was admitted to the road. If the result was less than 500 lb. per square inch, curing was continued. A second beam was broken at 10 days. If this test met the requirement, the pavement was thrown open to light traffic.

As long as pit and quarry operations continued, the berming outfit consisted of five teams and scrapers and a Caterpillar 5-ton tractor pulling an Adams grader. As soon as aggregates to meet all requirements had been produced, however, and the pit and quarry equipment could be released for other purposes, Superintendent Mullett put the Massillon shovel, two trucks, and three more teams on shoulder construction. The augmented crew quickly cleaned up the last operation on the job.

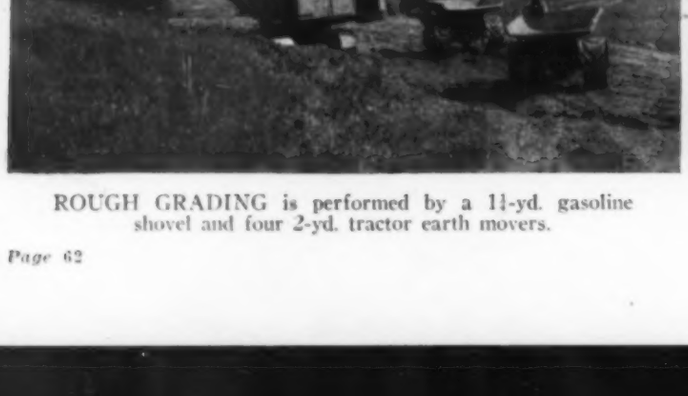
Equipment—As might be expected on a concrete highway project producing its own aggregates at two plants, the great quantity of equipment required ran the plant cost above one-third of the contract price. A complete list of equipment follows:

Culverts
1 Jaeger 7-S mixer

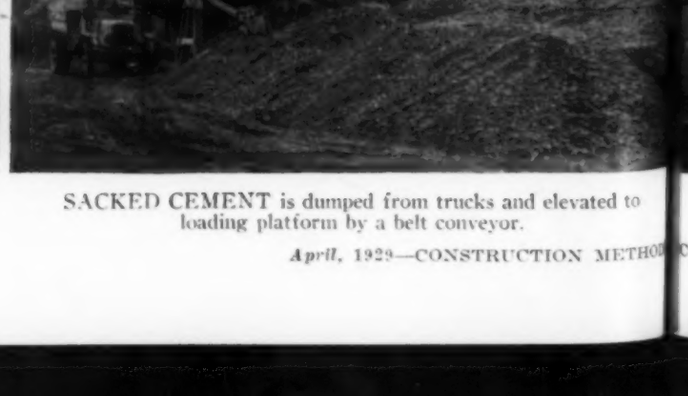
Stripping
1 Massillon 35 1¼-yd. gasoline shovel

Quarry and Crushing Plant
4 1½-yd. Koppel dump cars
1 Fordson tractor
2 Ford trucks
Tipple and platform (cap. 75 tons)
1 9x16 jaw crusher, Iowa Mfg. Co.
1 bucket elevator

DOUBLE TARPAULINS attached to batch gates of the trucks, keep cement dry and separate from aggregates on haul to mixer. Cement is dumped on one tarpaulin and covered with the other.



ROUGH GRADING is performed by a 1¼-yd. gasoline shovel and four 2-yd. tractor earth movers.



SACKED CEMENT is dumped from trucks and elevated to loading platform by a belt conveyor.

1 30-in. rotary screen
1 20-40 gasoline tractor (Nicholas-Shephard)

Screening and Washing Plant

2 fresno scrapers
1 64-ft. Columbus bucket elevator
1 Telsmith screen and washer
1 sand settling tank
1 20-hp. Continental motor
1 5-in. Neiman pump and 20-hp. Continental motor
3 70-yd. bins.

Rough Grade

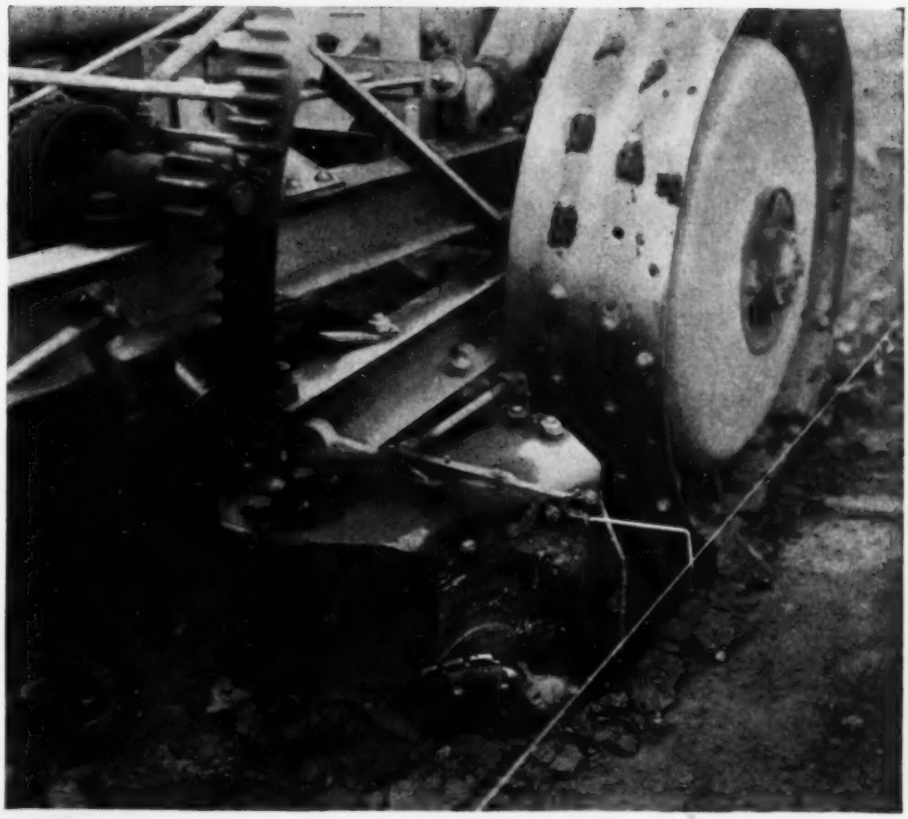
1 Lorain 75 1¼-yd. gasoline shovel
4 Hughes-Keenan iron mules (2-yd.)
1 Schramm 150-cu.ft. compressor
1 Ingersoll-Rand Jackhamer
1 Galion motor grader
1 Galion 10-ton motor roller

Fine Grade

1 5-ton Caterpillar tractor
1 Galion grader (8-ft. blade)
1 10-ton Monarch roller and scarifier
1 Lakewood subgrader
1 Carr formgrader
2,300 lin.ft. Blaw-Knox road forms

Stock Piles

2 trucks hauling stone
2 trucks hauling sand and gravel
3 trucks hauling cement
3 Barber-Greene bucket loaders
1 Columbus belt conveyor



SCREW CUTTER and indicator, with gears for adjusting grade of cut, on the formgrader. The cord guides the machine in cutting trench to line and grade.

BELTING BY HAND precedes spreading of the burlap which is kept wet for 24 hours and then is replaced by a covering of earth.

Concrete Slab

6 Hug two-batch trucks
1 Koehring 27-E paver
1 C.H. & E. triplex pump
4 miles of 2-in. pipe
1 Heltzel trail grader
1 Lakewood finishing machine
1 Heltzel bridge

Berming

1 5-ton Caterpillar tractor
1 Adams leaning wheel grader
5 scrapers

Resident Engineer Ross E. Hamilton, Coshocton, Ohio, supervised construction of the road, acting under the direction of Robert S. Beightler, chief engineer of the Department of Highways, Columbus, Ohio. P. J. Schneeberger was assistant superintendent under Mr. Mullett.

ALL FORM JOINTS are straight-edged and tamped to insure a smooth pavement surface.

GAGE used in setting steel center line joint strip.

Welders *Noiselessly Erect*

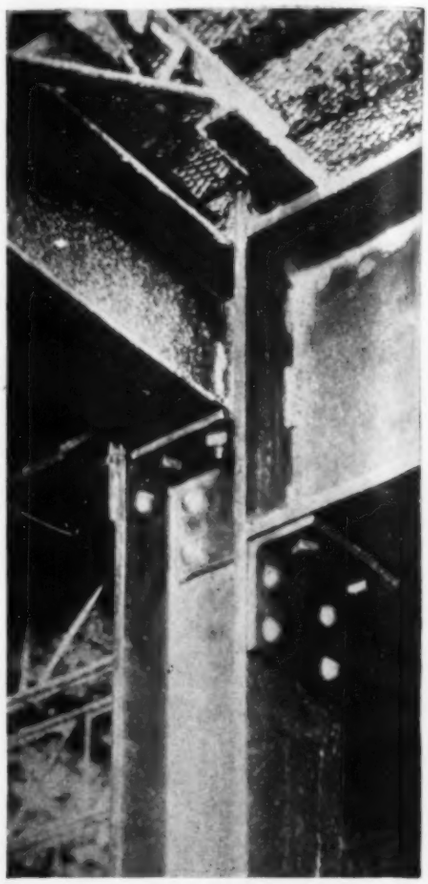
IN NO class of construction has the noiseless process of electric-arc welding proved of more value than in the erection of steel for additions to hospital buildings. The noise of riveting hammers, so disturbing even to healthy persons, is often most harmful to patients recovering from illness or surgical operations.

This fact was kept in mind when the contract was let recently for a $250,000 six-story addition to the Ohio Valley General Hospital at Wheeling, W. Va., and as a result of the erection of the steel frame by the electric-arc welding process, patients were undisturbed and surgeons, doctors and nurses performed their tasks in the usual quiet.

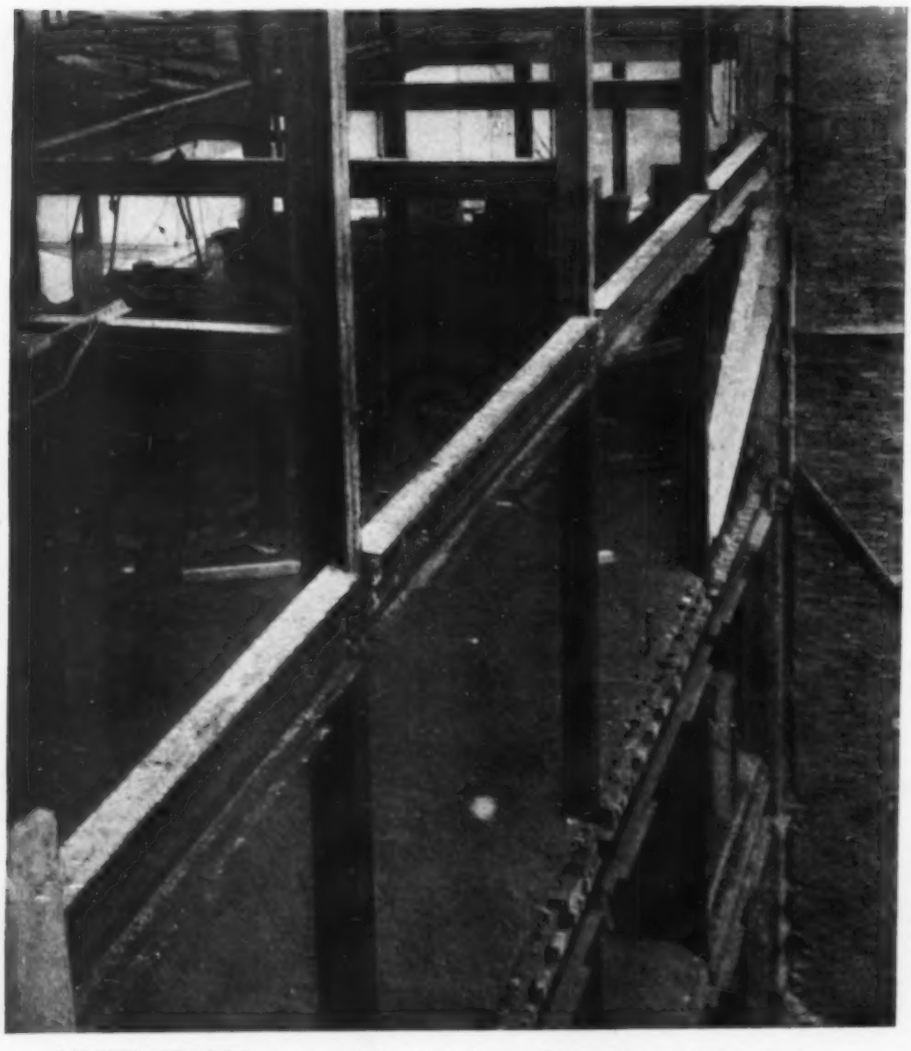
The present building forms three sides of a square, one side six stories high and the other two sides five stories high. The addition incloses a court and brings all sides of the square up to a height of six stories. The building was designed by Charles W. Bates, an architect of Wheeling, and was erected by R. R. Kitchen & Company of that city.

Welded Connections—Riveted construction was used for the shop fabrication of the structural steel, but the electric-arc welding process was used for all field connections, the members being held by field bolts prior to welding. The photograph at the right on this page shows a typical beam-to-column connection. The intermittent fillet welds which secure the webs of the beams to the column take the place of connecting angles. This type of connection eliminates considerable shop and field fabrication which would have been necessary in using riveted construction.

The method of splicing the columns



TYPICAL BEAM-TO-COLUMN CONNECTION. Intermittent fillet welds take the place of connecting angles.



LINTEL PLATES were welded to the bottoms of the exterior beams. C clamps held the lintels in position while the welder fused them to the beam flanges.

is shown in the large photograph on the opposite page. The splice plates were riveted in the shop to the lower column section. About two-thirds of a splice plate was used to make the riveted connection, which required six rivets. The remaining or upper third of the splice plate was punched for two field bolts which held the upper section in place while fillet welds were run around the edges of the splice and filler plates, fusing them into the flanges of the upper column section. In this photograph also may be noted the method employed in connecting the exterior and tie beams to the exterior columns. Intermittent fillet welds 3 in. long tie the 15-in. I-beams into the columns.

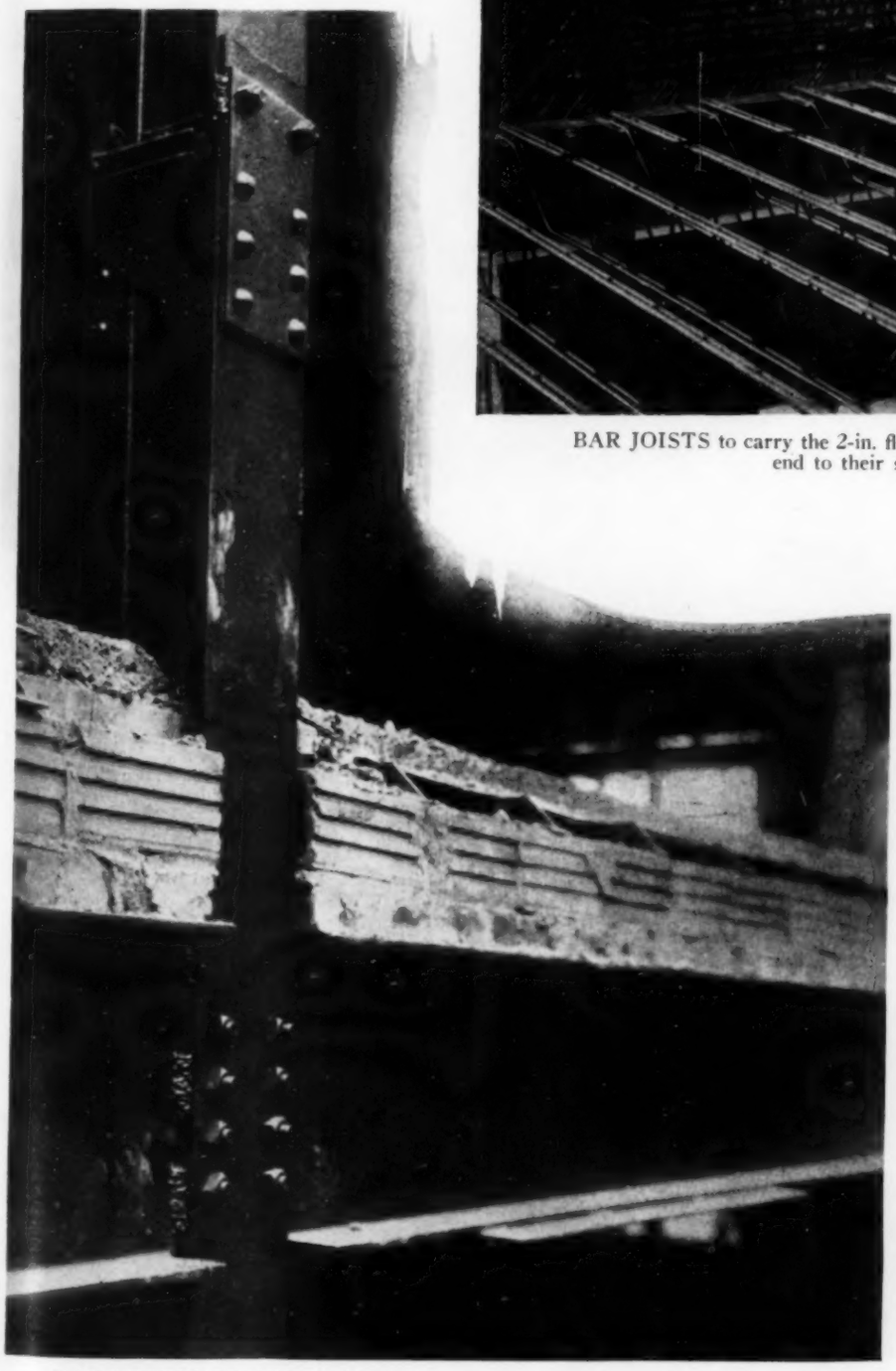
Lintels Welded to Beams—Where openings occurred in the exterior walls, lintels to span the top of the openings were welded to the bottom of the exterior beams as shown in the photograph at the bottom of this page. To secure the plate lintels to the beams by the riveted method would have required

Frame of Hospital Addition

considerably more laying out, in addition to punching the beam flanges and plates and driving the rivets. By the use of C clamps the lintel plates were held in position while one welder operator fused steel into steel with the electric arc in one-third the time required for riveted fabrication.

Welded bar joists were used to carry the 2-in. concrete floor and roof slabs.

BAR JOISTS to carry the 2-in. floor and roof slabs were welded at each end to their supporting beams.



IN SPLICING COLUMNS, fillet welds were run around the edges of the splice and filler plates fusing them to the flanges of the upper column section. Exterior and tie beams were connected to exterior columns by intermittent fillet welds 3 in. long.

These joists were welded in place at each end to their supporting beams. This improved method of securing the floor joists gives increased stiffness to the entire structure. To give the joists increased lateral stiffness a $\frac{3}{8}$-in. rod was laid across the bottom chords of the joists in the center of their span and welded to each joist. This increased the rigidity of the joists to a far greater extent than if they had been bridged in the usual way with wire.

The contractors erected the 150 tons of structural steel used in the framework, two portable motor-driven Lincoln arc-welding machines of 300 amp. capacity supplying the current.

Advantage of Quiet Fabrication—A demonstration of the value of silent erection offered by arc-welded steel construction was made during the progress of this work when two surgeons performed an abdominal operation in almost absolute silence while only 15 ft. away a welding operator was making beam to column connections with the electric arc.

R. R. Kitchen, head of R. R. Kitchen & Co., which handled the steel erection, estimated that the cost of arc-welded steel erection would not exceed and might prove less than the cost of a field riveted job.

CREOSOTED TIMBER FLUME

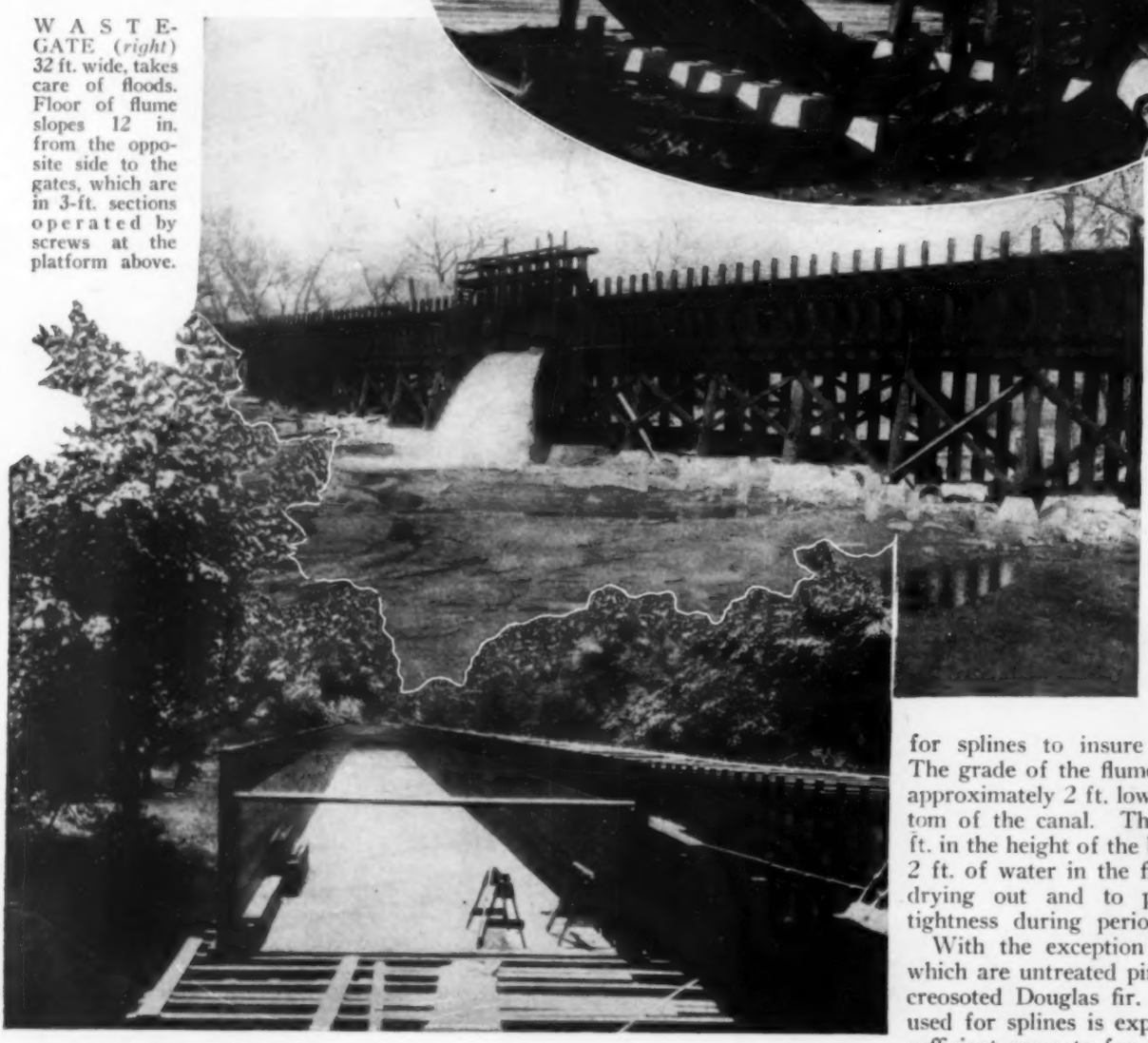
Carries Irrigation Canal Across Creek

IN REHABILITATING the irrigation system which furnishes water for 25,000 acres of land east of Denver, the Board of Water Commissioners of the city and county found it necessary to build a 1,032-ft. flume which would carry the main or High Line Canal across Plum Creek Valley. After thorough consideration the Commissioners decided that a flume constructed of creosoted timber fulfilled all the requirements of adequacy, permanance and low cost.

Bents of six 12x12-in. timbers resting on concrete pedestals supported by concrete footings carry the load of 75 tons for a 15 ft. 6-in. span when the 19 ft. 2 in. x 9-ft. flume is carrying its full capacity of 800 sec.-ft. Caps, 12x12 in., 22 ft. long, carry ten lines of 8x18-in. stringers in 32-ft. lengths, arranged to break joints in alternate lines at each bent. The 3-in. plank lining of the flume is nailed to 6x6-in. x 24-ft. strips on the bottom and is supported by 6x8-in. x 12-ft. uprights on the sides. The planks are grooved for splines to insure watertightness. The grade of the flume at each end is approximately 2 ft. lower than the bottom of the canal. This drop saves 2 ft. in the height of the bents and leaves 2 ft. of water in the flume to prevent drying out and to preserve watertightness during periods of no flow.

With the exception of the splines, which are untreated pine, all timber is creosoted Douglas fir. The soft pine used for splines is expected to absorb sufficient creosote for protection along with enough water to insure tight joints.

WASTE-GATE (*right*) 32 ft. wide, takes care of floods. Floor of flume slopes 12 in. from the opposite side to the gates, which are in 3-ft. sections operated by screws at the platform above.



BENTS (*above*) composed of six 12x12-in. posts and a 12x12-in. cap are spaced 15 ft. 6 in. apart. The posts rest on concrete pedestals which are carried on concrete footings. Outer posts are battered. One footing carries the four inside pedestals.

UPRIGHTS are bolted to outer stringers and are strengthened to resist outward thrust of water in flume by 6x6-in. pieces bolted to the nailing strips and by ¾-in. tie rods drawing opposite uprights together. Old flume at the right.

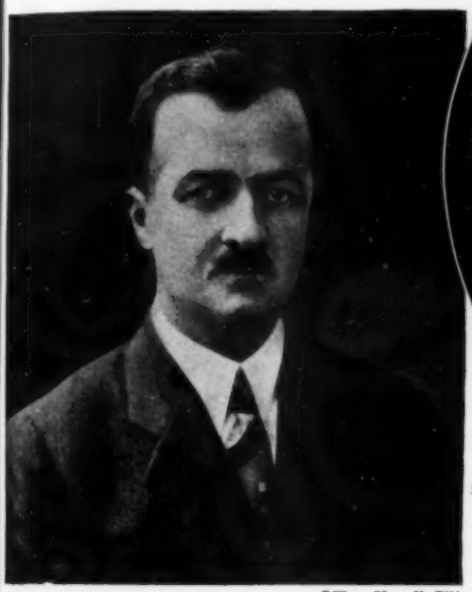
Present and Accounted For —

A Page of Personalities

THREE GOVERNORS

WHO STARTED THEIR CAREERS

WITH A TRANSIT



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CLAYTON DOUGLASS BUCK, governor of Delaware, devoted practically all his activities from the day he left college to building roads in the state. He moved to the governor's office, in January, 1929, from that of chief engineer of the state highway department.

©Wide World

FRANK COLLINS EMERSON, governor of Wyoming, after 23 years of engineering practice which included positions as chief engineer for two irrigation companies, superintendent for two irrigation associations, president of a farmers' co-operative lumber company, and state engineer, became chief executive of the state in January, 1927.

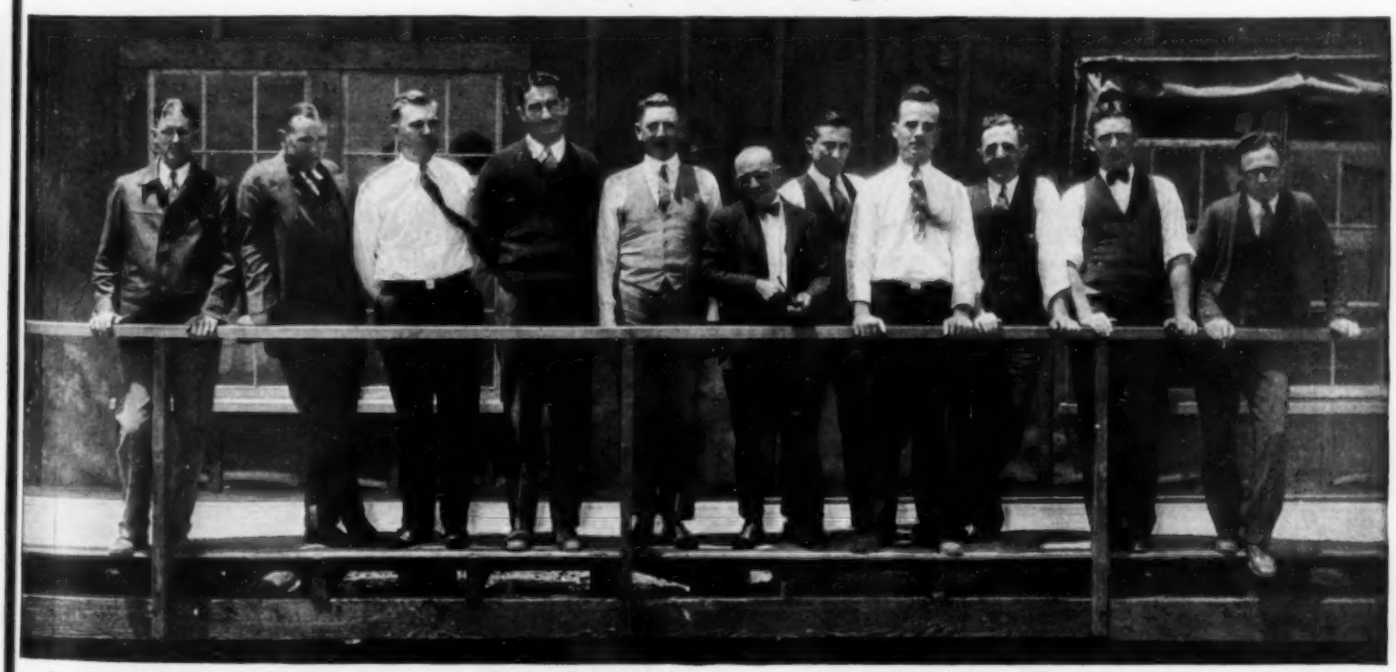
CHIEF EXECUTIVES

OF DELAWARE, NEW JERSEY AND

WYOMING ARE ENGINEERS

MORGAN F. LARSON, governor of New Jersey, rose through positions as Perth Amboy city engineer, Middlesex County engineer, and state senator to his present office, which he assumed, January, 1929. He served three terms in the senate while acting as city or county engineer.

At the Business End of a Bridge Job

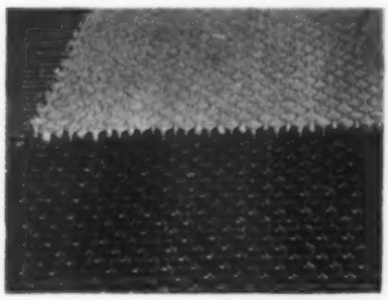


OFFICE FORCE at Mt. Eden, Calif., on construction of the San Francisco Bay Toll Bridge (described on pp. 46 to 50 of this issue) for the Raymond Concrete Pile Company. (*Left to right*) R. F. Leftwich, concrete technologist; R. A. McMenimen, works manager; E. L. Clements; W. T. Owen; H. S. McCormick; R. S. Johnson; W. H. Walthall; C. W. Miller; William Hurley; J. F. Gillespie, office manager; and H. M. Crowley, field office engineer. The bridge was opened to traffic March 2.

NEW EQUIPMENT ON THE JOB

To Protect Concrete Floors

The Blaw-Knox Company, Pittsburgh, has placed on the market a product called Floorgard for steel-armoring concrete floors. It is a built-up continuous steel mat which supplies a wear-resisting surface to concrete floors and takes care of stresses



by distributing loads over a wide area. Corrugated steel strips placed on edge and carried on circular steel rods inserted through holes in the middle of the strips form a rectangular surface pattern in which the concrete ridges between strips are monolithic with the slab. Various sizes of mesh are provided for different services. Under the name Pavegard a similar steel armoring is made for pavements.

Aluminum Bodies Lighten Truck Weights

Lighter motor truck bodies and bigger pay loads are the objectives sought in development work recently undertaken by the Auto Truck Equipment Company of Pittsburgh, which, in co-operation with the Aluminum Company of America, has constructed and placed in service a number of different types of motor truck bodies made of strong alloys of aluminum. While the first cost of an aluminum

body is higher than that of a steel body, substantial savings in operating cost are made possible by the use of the lighter material, according to the company's figures.

In the case of a local sand company operating 6½-ton Mack trucks, with 5-yd. dump bodies, studies showed a saving of 1,500 lb. in weight of truck body and hoist by the use of aluminum instead of steel. The increased first cost for the aluminum equipment was $537, but this figure is more than offset by an estimated annual saving of $625 in operating costs.

In another case, that of a coal company, it was found possible to substitute a 6½-yd. aluminum body for a 5-yd. steel body without increasing the weight. The additional first cost was $645, but estimated annual savings in operation totaled $1,332.

In addition to the lighter weight and lower operating cost, an added advantage claimed for the aluminum body is that it will not rust.

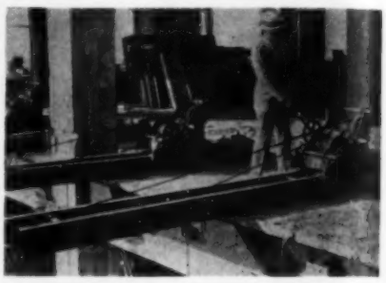
Improved Clamshell Models

The Owen Bucket Company of Cleveland has introduced two improved types of clamshell buckets. Type D is designed for heavier digging and

handling uses and is made in standard, extra heavy, and narrow models. The bucket has one-piece extra heavy, renewable jaws, grit-proof lubricated bearings, and low concentration of weight for greater digging power. Type S rehandling bucket, because of its width and jaw spread, is particularly efficient for cleaning up materials piled to shallow depths over wide areas. The bucket is made in standard, heavy and special models. Its design includes one-piece steel cross-head, concentration of weight on the centershaft to increase digging power, sealed centershaft bearings, reinforced shell construction, and a special sheave mounting on the counterweight to prolong the life of cables.

New Scaffold Hoist

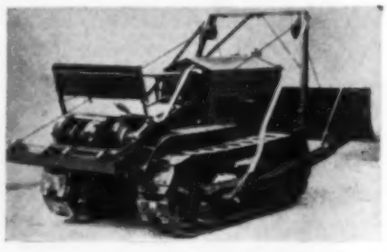
A suspended scaffold raised and lowered by manually operated hoists has been developed by Paschal L. Bottoms and Henry Riley, of Amarillo, Tex. The hoist itself consists of two drums mounted on a pair of channels which carry the guide pulleys for



cables attached to the two sides of the platform. Sliding pinions on an intermediate shaft mesh with the gears of the drum shafts either independently or in unison, depending upon whether the operator desires to wind both cables or only one. Pawls lock the drum gears and pinions. To lower the scaffold, the operator releases the pawls and controls the speed of descent by pressure on a foot lever which operates a band brake on the pinion shaft.

Power-Operated Bulldozer

The Miami Trailer-Scraper Company, Troy, Ohio, announces a power-operated bulldozer to be attached to the standard extended axle of a Cletrac tractor. Two cables connected to the ends of the 7-ft. blade are operated by a Miami winch driven from the power take-off of the tractor. The A-frame carrying these cables is mounted directly on the track frame



by means of a universal connection. The blade, therefore, follows the ground surface, and gouging is minimized. One lever controls all movements of the load. The bulldozer does not interfere with use of the tractor for pulling.

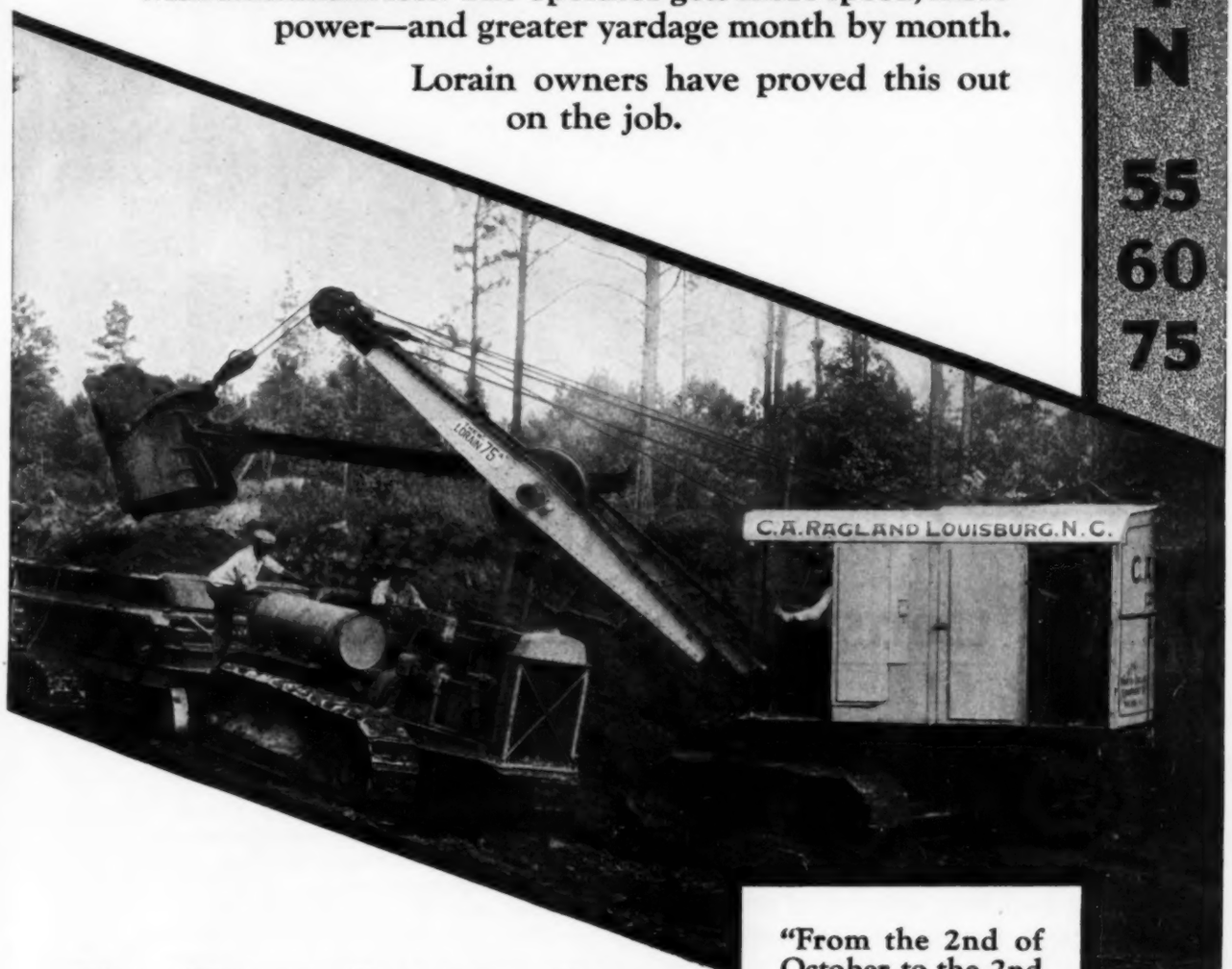
PAY DIRT

IT'S often the extra power and extra speed in the shovel itself that turns an ordinary earth moving job into real pay dirt.

The Center Drive principle, upon which the Lorain machine is designed, takes the power from the motor to hoist, crowd, swing or travel—simply, directly, and with minimum loss. The operator gets more speed, more power—and greater yardage month by month.

Lorain owners have proved this out on the job.

LORAIN 55 60 75



THE THEW SHOVEL CO.
Lorain, Ohio

Shovels · Cranes · Draglines · Backdiggers
Locomotive Cranes
Gasoline, Steam or Electric Powered

T H E W

"From the 2nd of October to the 2nd of January we dug 91,647 yards with our Lorain-75 1¼ yard machine.

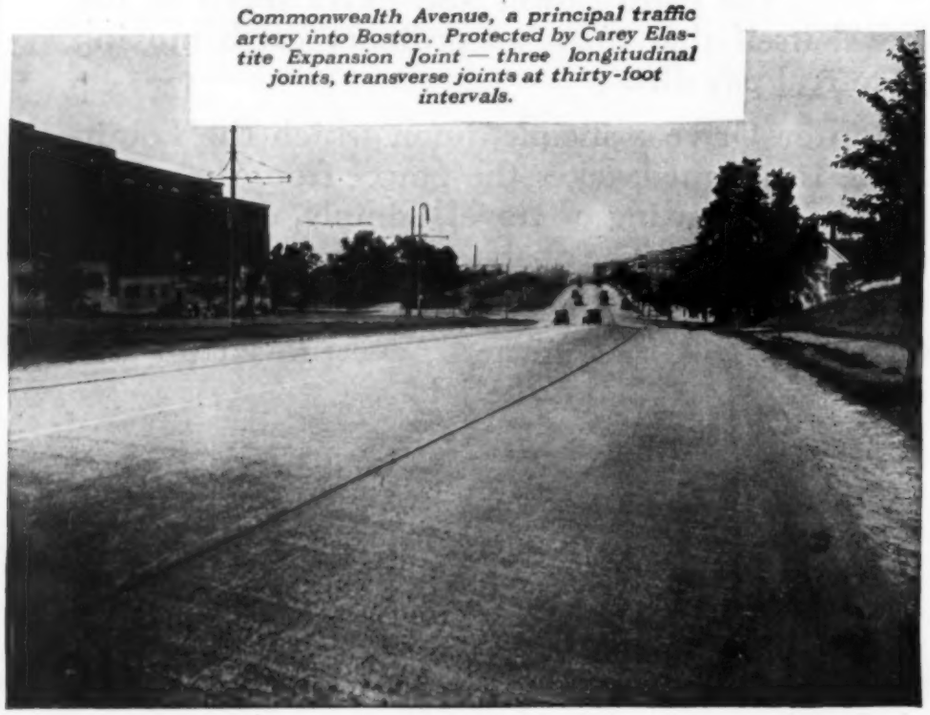
"Our Lorain-75 is the fastest moving machine I have ever seen."

C. A. RAGLAND,
Louisburg, N. C.

THEW CENTER DRIVE

On such splendid concrete roads as this,

Commonwealth Avenue, a principal traffic artery into Boston. Protected by Carey Elastite Expansion Joint — three longitudinal joints, transverse joints at thirty-foot intervals.



Carey Elastite Expansion Joint is used transversely and longitudinally *because:*

IT absorbs over-strains of expansion and contraction—keeps concrete work smooth. Under an astonishing amount of traffic impact, it remains super-serviceable.

It keeps its shape. It will not melt, it will not become brittle; it is not affected by frost or moisture. It reduces maintenance expense and adds but a trifle to the cost of construction. Common labor can install it easily. There is no loss, no waste, no breakage.

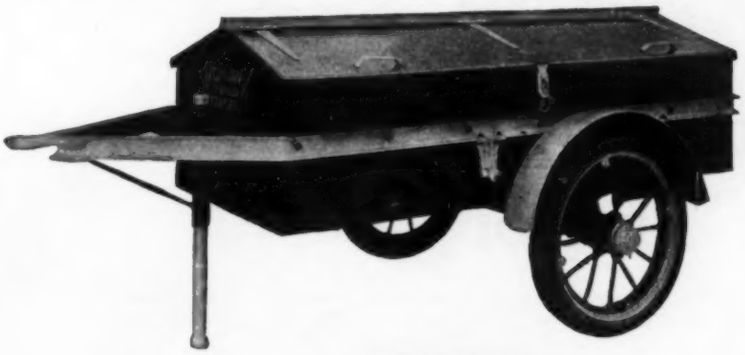
Carey Elastite Expansion Joint

is made of carefully selected fibrous asphalt, permanently pressured between two layers of asphalt-saturated felt. It meets any expansion joint specifications, anywhere, and it lasts as long as the concrete it protects. Write for particulars about modern methods of Expansion Joint installation.

Carey Elastite EXPANSION JOINT

THE PHILIP CAREY COMPANY, *Lockland,* CINCINNATI, OHIO

"The Last Word in Modern Equipment for The Progressive Contractor"



The Mohawk Hi-Speed Tool Box Will Add to the Profits on Every Job.

Announcing the NEW MOHAWK HI-SPEED TRAILER TRADE-MARK

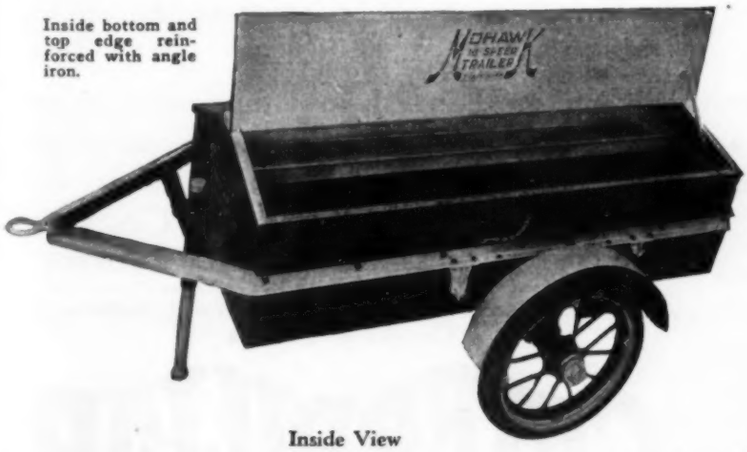
Contractors Portable Tool Box

NO MORE LOSS OF TOOLS BY THEFT, LOAD TOOLS AND LOCK DOWN THE COVERS
NO MORE LIFTING OR LUGGING, HOOK IT TO THE TRUCK AND STEP ON THE GAS

What contractor hasn't wanted a strong portable tool box like this? When exhibited for the first time at the recent Road Show, the Hi-Speed Trailer struck the fancy of every contractor who saw it. Notice the husky construction and careful design of every detail.

Rugged Construction Details: Body made of 10, 12, and 14 gauge steel. Extra heavy welded. Mounted on half elliptic springs. 2 inch axle. Firestone tires and special length roller bearings with alemite fittings. Positive non-slip adjustable supporting leg, front and back rigidly connected to channel frame.

Inside bottom and top edge reinforced with angle iron.



Inside View

Size of tool compartment: 7 ft. long, 3 ft. wide, and 2 ft. high, with sliding tray for small tools, 1 ft. wide by 7 ft. long. Adjustable to center or either side of box.

Use the coupon and let us quote you the *delivered* price on one or more outfits. →

YES, Please tell me more about the Mohawk Hi-Speed Trailer.

Mohawk Asphalt Heater Co.,
Schenectady, N. Y.

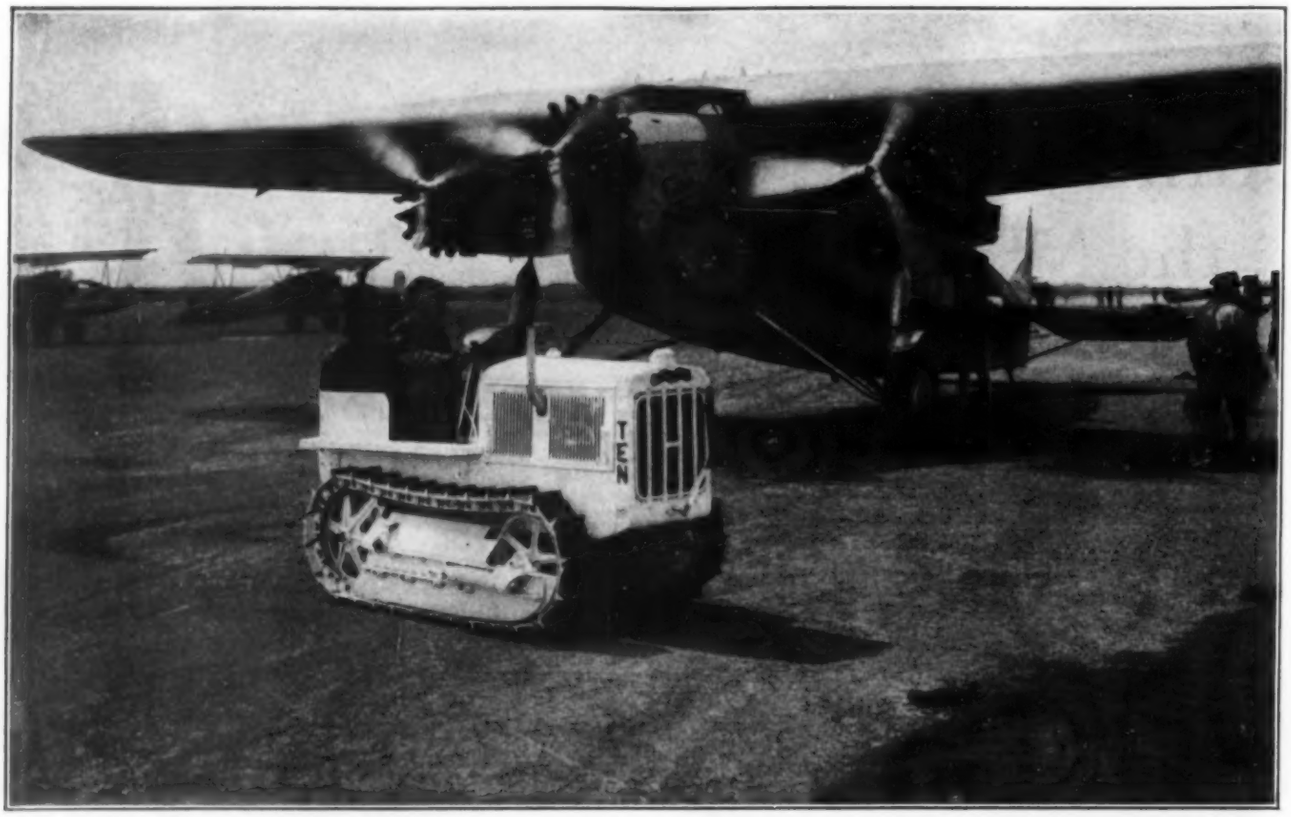
Name .....

Address .....

I am a Contractor ☐
I am a Distributor ☐

MOHAWK ASPHALT HEATER CO., Dealers and Service Stations in Principal Cities
Main Office and Works, Schenectady, N. Y.

The Airminded "Caterpillar" Tractor



Landing fields to be kept smooth, planes to be pulled from hangars, snow to be pushed aside, . . . all sorts of jobs to be done from heaving a big tri-motor out of the mud to doubling for a disabled stationary engine.

The "Caterpillar" track-type tractor is airminded. Agile, sure-footed, powerful ground-gripper that it is, the "Caterpillar" has become an indispensable friend to the flyer at a score of airports. Here is the new Model Ten helping a tri-motored Fokker out into the open.

There is a "Caterpillar" dealer within reach of your phone. Ask him how "Caterpillars" help to keep the upkeep of airports down.

Caterpillar Tractor Co.

EXECUTIVE OFFICES: SAN LEANDRO, CALIFORNIA

Sales Offices: Peoria, Illinois • 50 Church Street, New York • San Leandro, Calif.

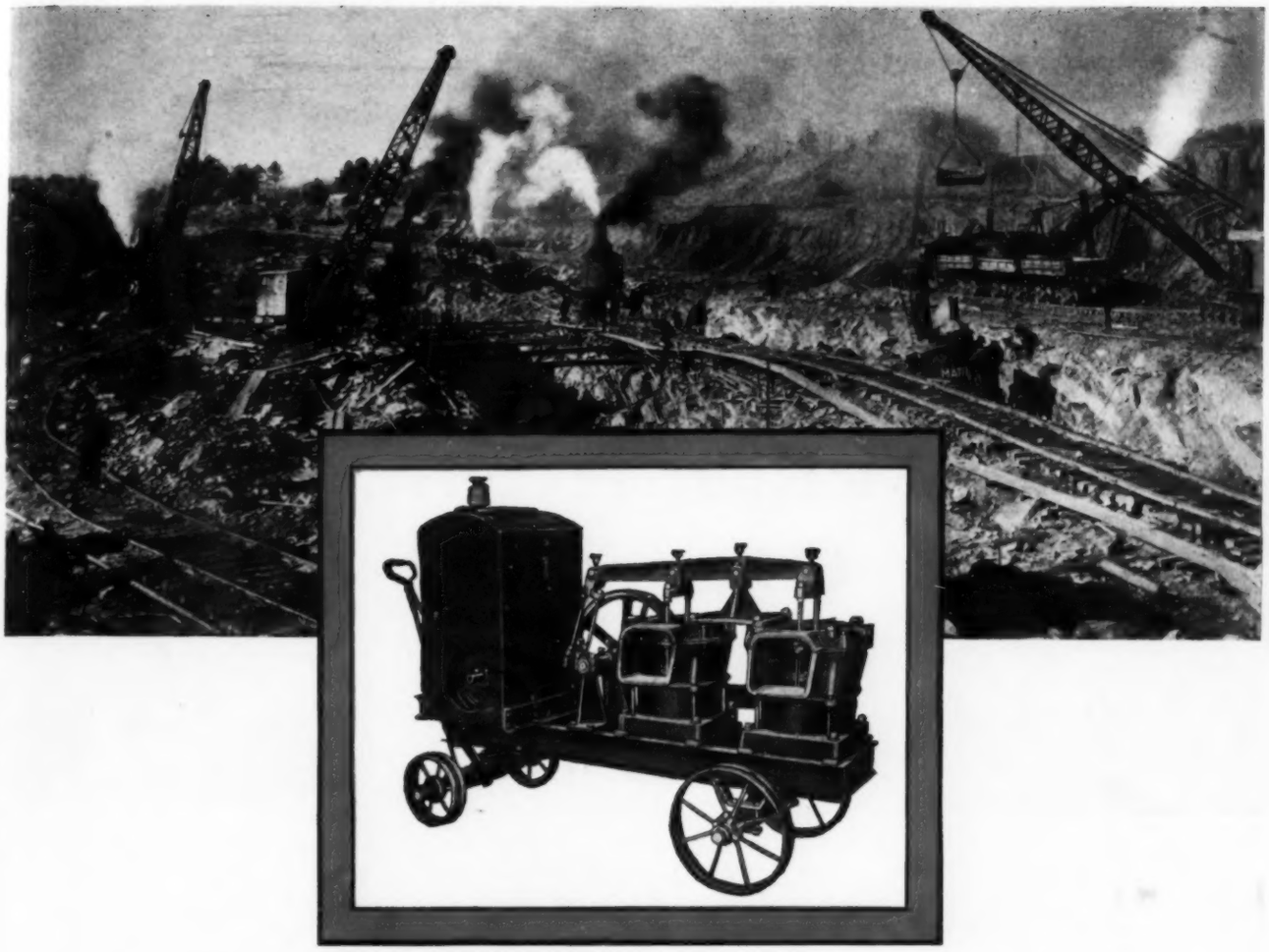
Holt Combined Harvesters • Russell Road Machinery

"Caterpillar" Tractors

CATERPILLAR

REG. U.S. PAT. OFF.

TRACTOR



For Greater Capacities and Higher Lifts

HOUR after hour, without stop or breakdown, Humphryes Double Diaphragm Pumps deliver big volume.

Maintained suction develops higher vacuum, higher suction lifts.

Real tests are made on the job. Humphryes capacity, sturdiness, dependability and accessibility make them favorites with contractors and distributors everywhere.

Let us explain in detail why Humphryes pumps consistently deliver "more gallons per day," and, in so doing, cut pump operation costs to the bone.

There's a Humphryes pump to meet every requirement. Send for bulletins describing the entire Humphryes line.

The Humphryes Manufacturing Co.----Mansfield, Ohio

HUMPHRYES
CONTRACTORS' PUMPS

Follow this McKiernan-Terry Construction Method *instead of mauls!*

The modern contractor doesn't waste time and money putting down sheeting like this with mauls and hand labor. No Sir! He uses McKiernan-Terry "Little Fellers" (Nos. 1, 2, or 3) and does the work in jig-time, clean and neat. Then he uses these same hammers to PULL as well. Remember this well—also the fact that we also make the great big hammers, such as 11-B-2 that put down the giant piles on land or under water. Send for catalog.

McKIERNAN-TERRY DRILL COMPANY
13 PARK ROW, NEW YORK

Pile Hammers and Accessories, Drilling Machinery

FOR SUCCESSFUL PERFORMANCE A.G.C.-A.

Works at Dover, N. J.

E. R. BACON CO.
San Francisco, Calif.
J. W. BARTHOLOW CO.
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FUNKHOUSER EQUIPMENT CO.
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H. B. TREVOR CO.
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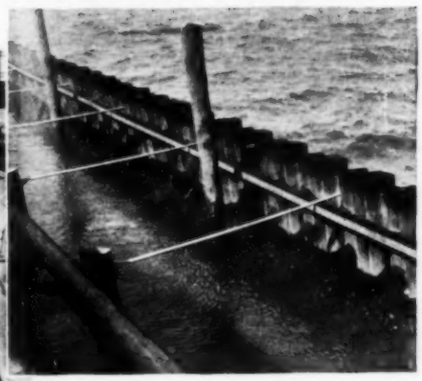
Foreign Representatives:
THE BRITISH STEEL PILING CO., LTD.
London, England

DRIVE — McKIERNAN-TERRY — PULL
The Pioneer Double-Acting Hammers

Lackawanna Steel Sheet Piling in *Mile-long* Sea Wall *at* Long Beach, N.Y.

Above: Front of piling wall showing steel channel wale.



Above: Timber, anchorage, tie rods, and the channel wale for supporting concrete cap.

Left: Freshly poured concrete which will protect the piling against corrosion above low water level. A portion of the completed wall shows in the background.

Deep-Arch Section DP165 Lackawanna Steel Sheet Piling was used in the construction of a sea wall, 5,320 feet long, for the City of Long Beach.

The high transverse strength of Lackawanna Steel Sheet Piling makes it particularly suitable for installations of this type.

A. Shriner, City Engineer, City of Long Beach, N. Y.

A. M. Hazell, Inc. New York City Contractor

Left: the overall thickness of this piling wall explains the high transverse strength of the Deep-Arch Section. Note the excellent alignment obtained in driving.

Below: Detail of reinforced concrete cap which protects steel against corrosion. On the outside the concrete extends below low water.

BETHLEHEM STEEL COMPANY

General Offices: Bethlehem, Pa.

District Offices: New York, Boston, Philadelphia Baltimore, Washington, Atlanta, Pittsburgh, Buffalo, Cleveland, Cincinnati, Detroit, Chicago, St. Louis, San Francisco, Los Angeles, Seattle, Portland and Honolulu.

Bethlehem Steel Company: Kindly mail me Bulletin 115, describing Lackawanna Steel Sheet Piling Sections:

Name:.....

Address:.....

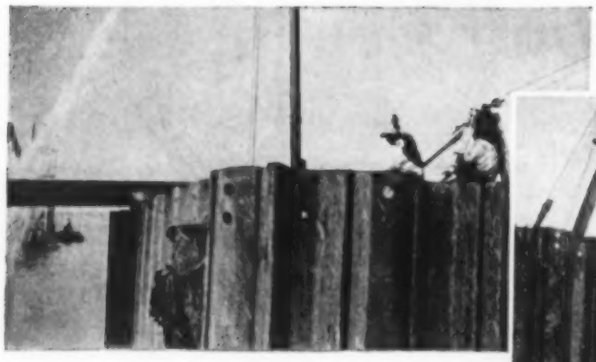
City:..... State:.....

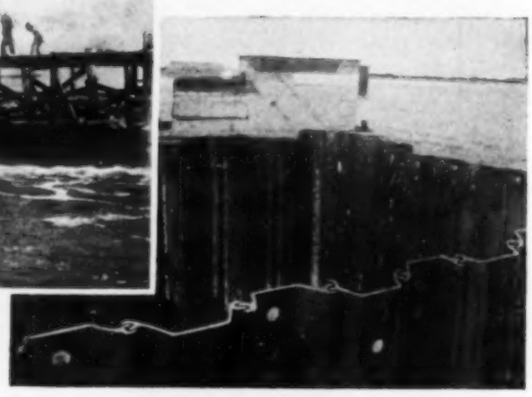
Company:.....

C.M. 1

BETHLEHEM

They had planned to excavate *with a* grab-bucket





Instead they used Picks

Preliminary soundings for the construction of this cofferdam at Sarasota, Florida, indicated that comparatively light driving would be encountered. Carnegie Steel Sheet Piling, Arch Web Section M-106, was ordered. This was to be driven, the cofferdams pumped, and then excavated with a grab-bucket. Later investigation developed that conditions were contrary to what had been expected. The engineer in charge stated that when the piling arrived, he doubted if it could penetrate this unusually hard material. Section M-106 was driven, however, and not the slightest difficulty was encountered. After the first cofferdam had been set up and pumped, it was found necessary to excavate with picks!

The engineer was delighted with the facility with which the piling was driven. After it had been driven four times, when the photographs above were taken, it was still in excellent condition. Another feature that pleased him especially was the ease with which the piling was pulled and the watertightness of the cofferdams. The cofferdams were 32'x15'x42' deep, in 24' of water, and the piling was driven through twelve feet of this extremely hard penetration.

A good friend for Carnegie Steel Sheet Piling was surely made on this job, just as it is doing everywhere it is used. Carnegie Piling is rolled in four highly efficient sections which meet all ordinary requirements.

Your inquiries are invited.

1958

CARNEGIE STEEL COMPANY

Subsidiary of **UNITED STATES STEEL CORPORATION**

CARNEGIE BUILDING ··· *PITTSBURGH, PA.*

for

Heavy Timber Construction

There's just one way to tighten or loosen lag-screws—*pump* them loose or *pump* them home with Lowell Lag-Screw Wrenches.

Contractors who have used ordinary open end wrenches and Lowell Lag-Screw Wrenches are strong for the Lowell reversible ratchet movement. Pumping is far quicker and easier than stopping to refit. The one is a steady movement; the other a series of constant interruptions.

Over 50 years' experience is a guarantee of careful design and best construction, but you are most interested in saving time and money on the job. Lowell Wrenches will do just this. That's why we say, "Send for complete catalog illustrating the many types and sizes." Big special wrenches for special needs.

Send for Catalog R

LOWELL REVERSIBLE RATCHET WRENCHES

Lowell Wrench Company
Worcester, Mass.

DIETZ "LITTLE WIZARD" COLD BLAST LANTERNS — THE UNFAILING BRIGHT LIGHTS

FULLEST protection to Contractors and Public when Dietz "Little Wizard" Red Globe Lanterns are stationed at danger points. This is why:

1. Little Wizard cold blast lights are "bright lights"—highest illuminating power obtainable in kerosene lanterns of small size.
2. Little Wizards are dependable—they stay lighted.
3. The red light of Little Wizards shouts DANGER in all languages—and RED is universally accepted as FAIR WARNING.

Last but not least—Dietz Little Wizard Lanterns meet the price requirements of Contractors.

R. E. DIETZ COMPANY
NEW YORK

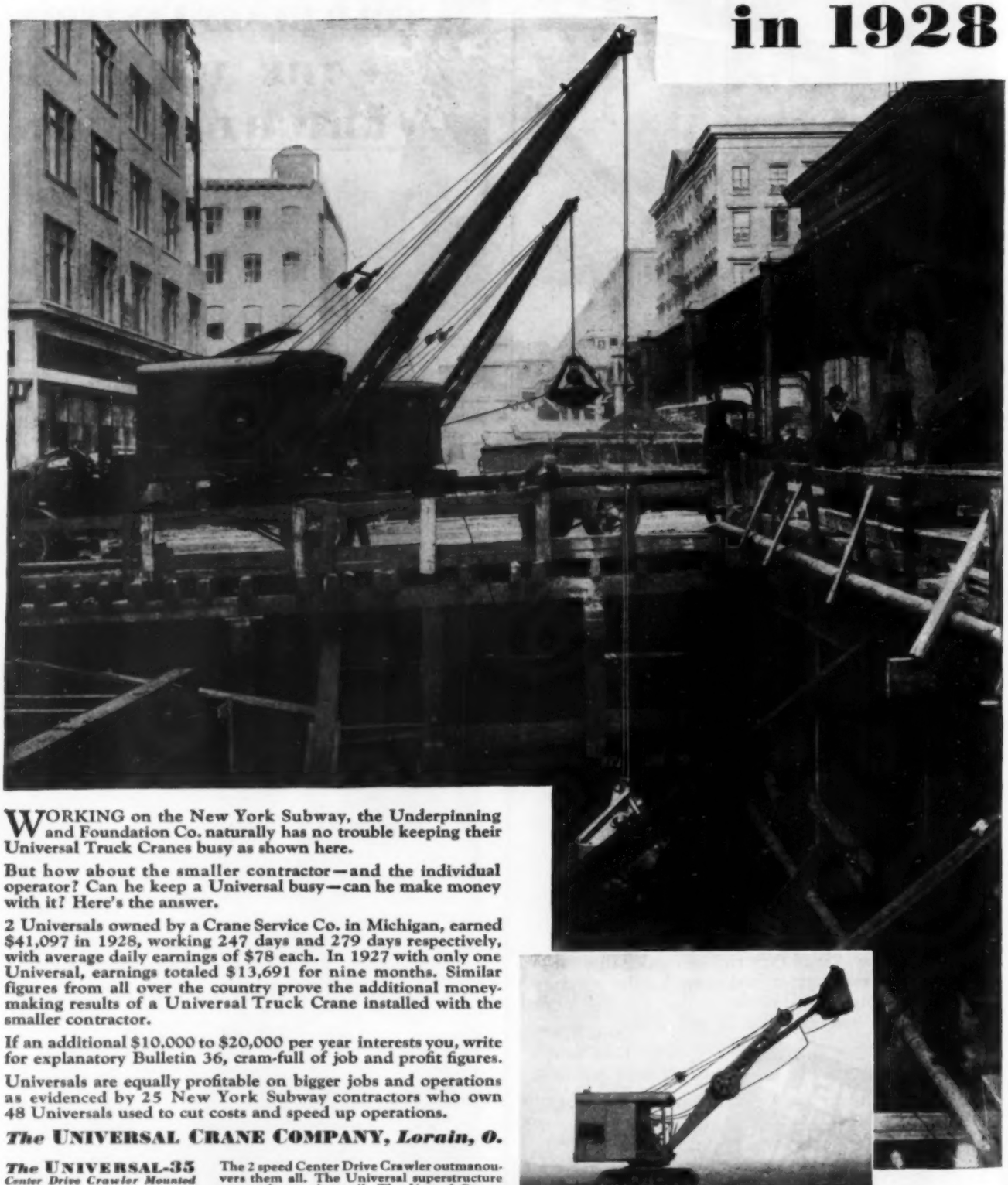
Largest Makers of Lanterns in the World

FOUNDED 1840

USE RED!

NO OTHER COLOR MEANS DANGER

2 Universals Earned $41,097 in 1928



WORKING on the New York Subway, the Underpinning and Foundation Co. naturally has no trouble keeping their Universal Truck Cranes busy as shown here.

But how about the smaller contractor—and the individual operator? Can he keep a Universal busy—can he make money with it? Here's the answer.

2 Universals owned by a Crane Service Co. in Michigan, earned $41,097 in 1928, working 247 days and 279 days respectively, with average daily earnings of $78 each. In 1927 with only one Universal, earnings totaled $13,691 for nine months. Similar figures from all over the country prove the additional money-making results of a Universal Truck Crane installed with the smaller contractor.

If an additional $10,000 to $20,000 per year interests you, write for explanatory Bulletin 36, cram-full of job and profit figures.

Universals are equally profitable on bigger jobs and operations as evidenced by 25 New York Subway contractors who own 48 Universals used to cut costs and speed up operations.

The* UNIVERSAL CRANE COMPANY, *Lorain, O.

***The* UNIVERSAL-35**
Center Drive Crawler Mounted

The 2 speed Center Drive Crawler outmanouvers them all. The Universal superstructure outperforms them all. The ½ yard Center Drive Shovel boom digs and dumps higher.

UNIVERSAL

There are times when certainty is precious beyond rubies. The sure grip, the cool hand, the solid footing—steadiness—precision—power—are qualities of men and machines not only admirable in themselves; often-times they glitter with the significance of golden profits.

Anyhow, Mike set this piece of 27-inch concrete pipe nicely, quickly and safely with his Keystone 4 Pullscoop ditcher.

The interested gentleman in the center is Mr. Brauniger, of Brauniger & Code, Youngstown, Ohio, the Contractors; and the snappy young fellow at the right is J. Walker Wilson, of the Mahoning Bank Building, Youngstown. He enjoys quite a bit of local fame as Keystone's representative in Northern Ohio. Probably he deserves it. The careful and skillful young man at the levers is Mr. Mike O'Hara.

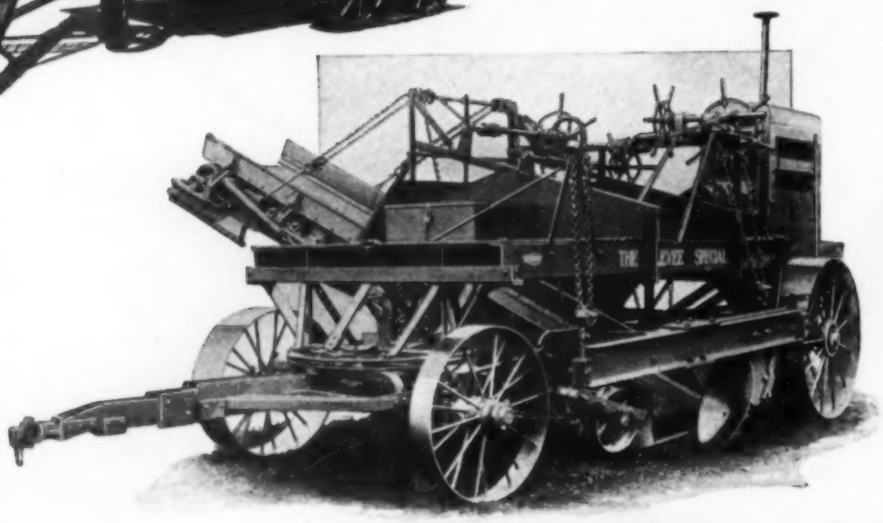
DIGS MORE KEYSTONE FOR A DOLLAR

9-D-51

KEYSTONE DRILLER CO.
BEAVER FALLS, PENNSYLVANIA
170 Broadway, N. Y.—Waukegan, Ill.—Joplin, Missouri

Western 7-yard Crawler Dump Wagon.

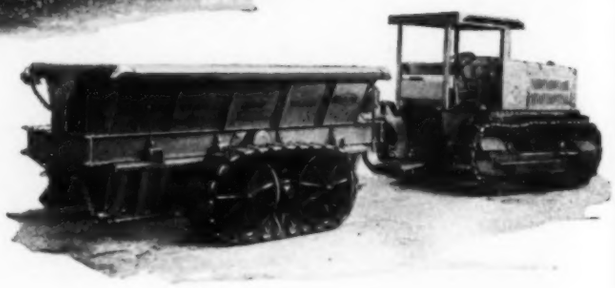
Made also with direct tractor hitch.



Western Levee Special Elevating Grader with motor-driven belt.

It is as great a step forward as was the Crawler Dump Wagon.

An . . . Unbeatable Combination *for* Moving Dirt



Western 5-yard Crawler Dump Wagon pulled singly or in trains.

This dirt moving combination is unbeatable:

For loading—A Western Levee Special Elevating Grader, which can load mud and sand.

For hauling—Western Crawler Dump Wagons, which can travel in mud and sand.

The Levee Special with its motor driven belt has demonstrated a capacity from 40 per cent to 75 per cent greater than the same size machine on which the belt is driven from the rear axle.

The ability of the Western Crawler Dump Wagons to carry capacity loads under the most adverse haulage conditions is common knowledge. They are furnished in six sizes and combinations to meet all requirements.

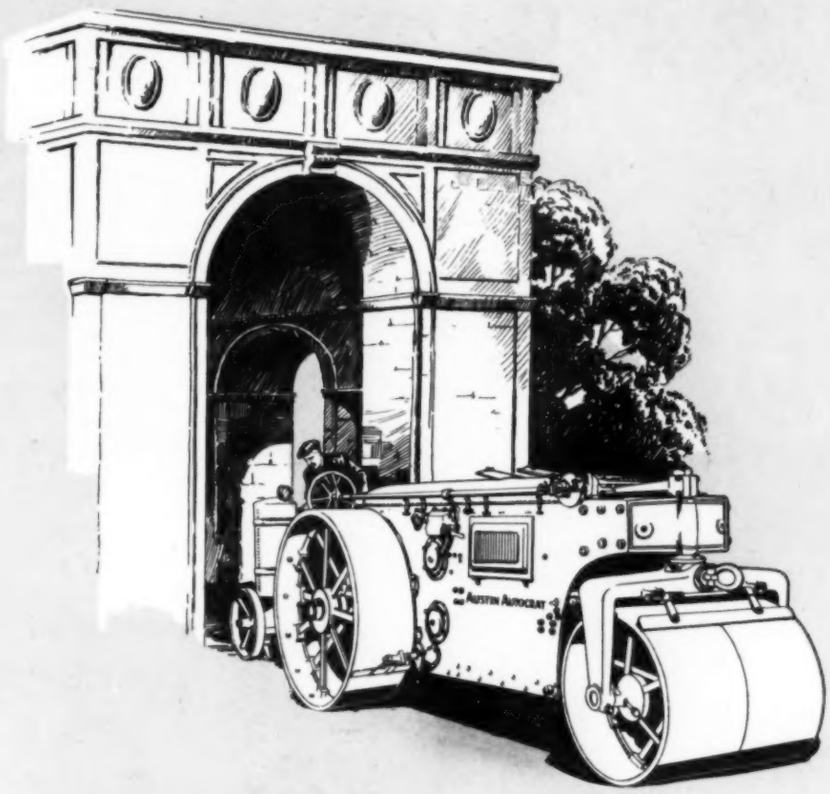
Where shall we mail your copies of Bulletins 29-AD and 29-BD which give detailed descriptions of this money-making combination?

Western Wheeled Scraper Co.
AURORA, ILLINOIS

WESTERN

DUMP CARS AND GRADING EQUIPMENT

"MOST MILES FOR YOUR ROAD DOLLARS"



Autocrats of the road

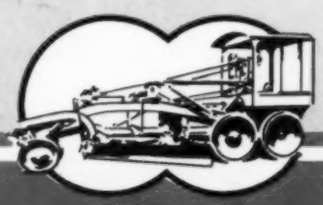
Beyond compare! Dominating by the absolute right that unquestioned superiority gives—the experience that years bring has never been more clearly shown than in Austin Rollers.

Since building the first American motor roller, the lead has been steadily increased in all types and classes. Today, these rollers are eloquent of Austin-Western ideals and policies of service.

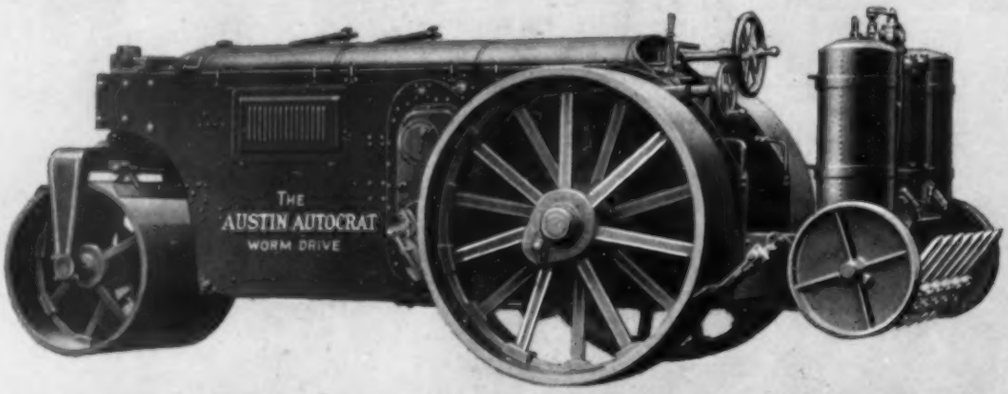
Never has greater value been offered to public officials or contractors. Fine performance with years of trouble-free service make every roller purchase an investment in good results.

As always, Austin-Western Road Machinery costs less in the long run because it gives *most miles for your road dollars.*

Austin-Western
ROAD MACHINERY

THE NEW  DUAL DRIVE

THE AUSTIN AUTOCRAT



THE WORLD'S FINEST ROLLER

Setting new standards for roller quality and performance

The Autocrat—*the best that experience and skill can produce*

The normal life of the Autocrat is years beyond that of any other roller because of the higher standard of material and workmanship. Every Autocrat feature means *better rolling performance.*

The Duplex Worm Gear Drive—the first to be used in any roller—gives the highest degree of efficiency in the transmission of power ever attained in a roller. The massive gears with large wearing surfaces in the Autocrat transmission will give years of service.

The last measure of handling ease is obtained through the three speeds, forward and reverse, and the 14″ twin disc clutches that reverse the direction of the roller without shifting gears or releasing a master clutch. The handsome stream-line body is designed to give complete accessibility to all working parts and controls. Other features include an electric starter, stored electricity for parking and lighting; and power steering and a pneumatic scarifier which can be supplied as extras.

The Autocrat is made in 10 and 12 ton sizes.

The CADET

the Autocrat of Pup Rollers

The latest member of the Austin Pup Roller family is the Cadet, a completely factory-built model patterned after the famous Autocrat. It is made in 5, 6 and 7-ton sizes, all of which can be fitted with the patented Austin front planing blade and pneumatic scarifier. The short wheel base of 8′11¾″—three speeds forward and reverse and the powerful 4-cylinder Buda motor puts the Cadet in a class by itself among pup-sized rollers.

THE AUSTIN-WESTERN ROAD MACHINERY CO.

400 North Michigan Avenue, CHICAGO, ILLINOIS—Branches in principal cities

Leaning Wheel Graders, Straight Wheel Graders, Motor Graders, Elevating Graders, Crawler Dump Wagons, Scarifiers, Rock Crushers, Portable Conveyors, Motor Sweepers, Street Sweepers, Sprinklers, Road Oilers, Hot Patch Portable Asphalt Plants, Plows and Scrapers

Why tremendous traction

Here Are Three Powerful Reasons:

1, *2016 square inches of traction surface on this "40." It is "every inch a tractor."*

2, *Draw Bar pulls down on a slight angle from the center (see illustration) and adds traction in proportion to the load.*

3, *The engine and all superstructure weight is directly over the crawlers and gives "balanced traction."*

Bates Steel Mule

JUST a few of the many strong reasons are shown above why the Bates Steel Mule Tractors operate so efficiently.

The Bates Tractor Book gives completely the important essentials of a tractor that you should know about before buying.

Let us prove to you why the Bates Steel Mule is "Every Inch a Tractor."

Write today for your copy of the Bates Tractor Book

CMB-101

FOOTE BROS. GEAR & MACHINE CO.
251-255 No. Curtis St.
CHICAGO, ILL.

Please send me copy of the Bates Tractor Book.

Signed_____

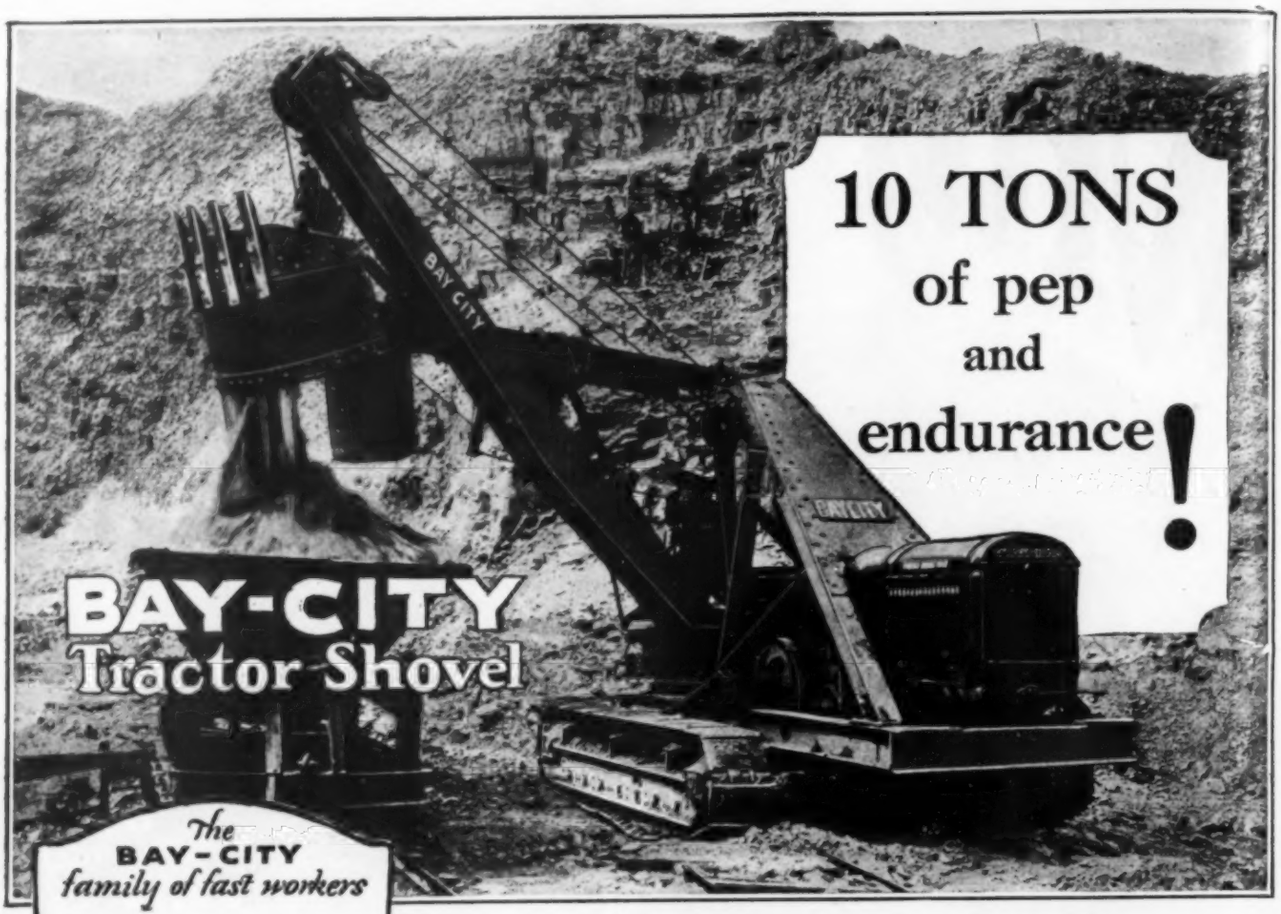
Address_____

9-29

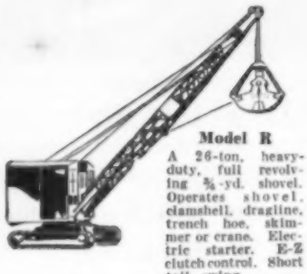
Established 1859

FOOTE BROS. GEAR & MACHINE CO.
Road Machinery Division
251-255 No. Curtis St., Chicago

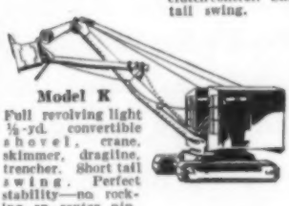
Sales and Engineering Offices in All Principal Cities, U. S. A., and Canada



The
BAY-CITY
family of fast workers



Model R
A 26-ton, heavy-duty, full revolving ¾-yd. shovel. Operates shovel, clamshell, dragline, trench hoe, skimmer or crane. Electric starter. E-Z clutch control. Short tail swing.



Model K
Full revolving light ½-yd. convertible shovel, crane, skimmer, dragline, trencher. Short tail swing. Perfect stability—no rocking on center pin. Weight, 13 tons.

Tractor Shovel
Recognized leader in its field. Operates shovel, trench hoe, clamshell, dragline, backfiller or crane boom. Weighs 10 tons.

Many contractors are writing in, saying: "Our only regret is that we did not buy the Tractor Shovel long ago."

Why not profit by their experience and take time by the forelock in buying yours? Nowhere else will a "stitch in time" save you so much.

You can operate the Tractor Shovel in crowded quarters where a big shovel can't be used. It is a sturdy, fast, convertible machine for a wide range of work. The picture shows it digging and loading hard blasted shale.

Send for new Catalog T-5.

BAY CITY SHOVELS, Inc.
formerly **Bay City Dredge Works**
New York Office—
302 Broadway
BAY CITY, MICH.

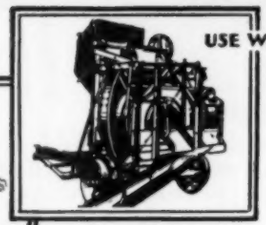
BAY-CITY

FULL OR PART CIRCLE — SHOVELS — CRANES — EXCAVATORS

This All-Purpose Mixer has earned its name — SPEED-KING

One Man End Control!

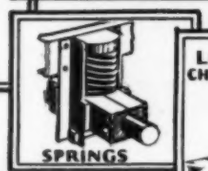
Famous Jaeger One-Bag Mixer with End Discharge ∽ Built of Steel ∽ Fast ∽ Portable ∽ Easy to Handle



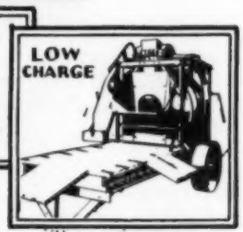
USE WITH SPOUT

to save wheelers in paving floors, alleys, walks or pouring into forms.

AUTOMATIC SKIP SHAKER

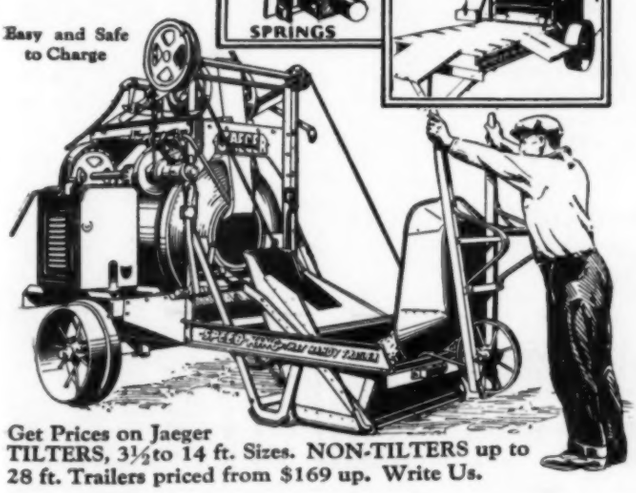


SPRINGS



LOW CHARGE

Easy and Safe to Charge



Get Prices on Jaeger TILTERS, 3½ to 14 ft. Sizes. NON-TILTERS up to 28 ft. Trailers priced from $169 up. Write Us.

IT takes only 5 seconds to charge, and 7 to 10 seconds to discharge this mixer. It needs only about 6 feet of street room. It's *spring mounted* on two roller bearing wheels with dual tires (for soft ground and pavements); it's 50% stronger and ⅓ ton lighter because it's built of steel.

In other words, here's a *fast, compact, portable, sturdy* one-bag trailer with all the special Jaeger features that make Jaeger the world's leader in mixer sales. Check the points here illustrated on this machine. They tell the story.

You can buy this mixer at a price under the market. And back of it is the quick, reliable service of over 100 Jaeger stations in principal cities and towns.

Ask us also about Handy 3½ S Trailer for $169 up.

— Mail this slip for Catalog and New Prices —

THE JAEGER MACHINE COMPANY.
800 Dublin Ave., Columbus, Ohio

Please send catalog, prices and terms on

NON-TILTS TILTING MIXERS
PLASTER MIXERS

Name _____

Address _____

_____

The Lowest Priced

1-Yard Machine on the Market

High quality does not always mean high price. In fact *the American Gopher Shovel-Crane is the lowest priced 1-yard machine on the market*—and a blind man can easily distinguish the remarkable advantages in construction and operation.

It has fewer parts. There is less maintenance for the operator to handle—less operating time lost.

You get a shovel-crane built of all-steel—with such wear and breakage-defeating advantages as oversized shafts of chrome steel, chrome steel crawler treads, a one piece steel revolving frame—and every casting is annealed.

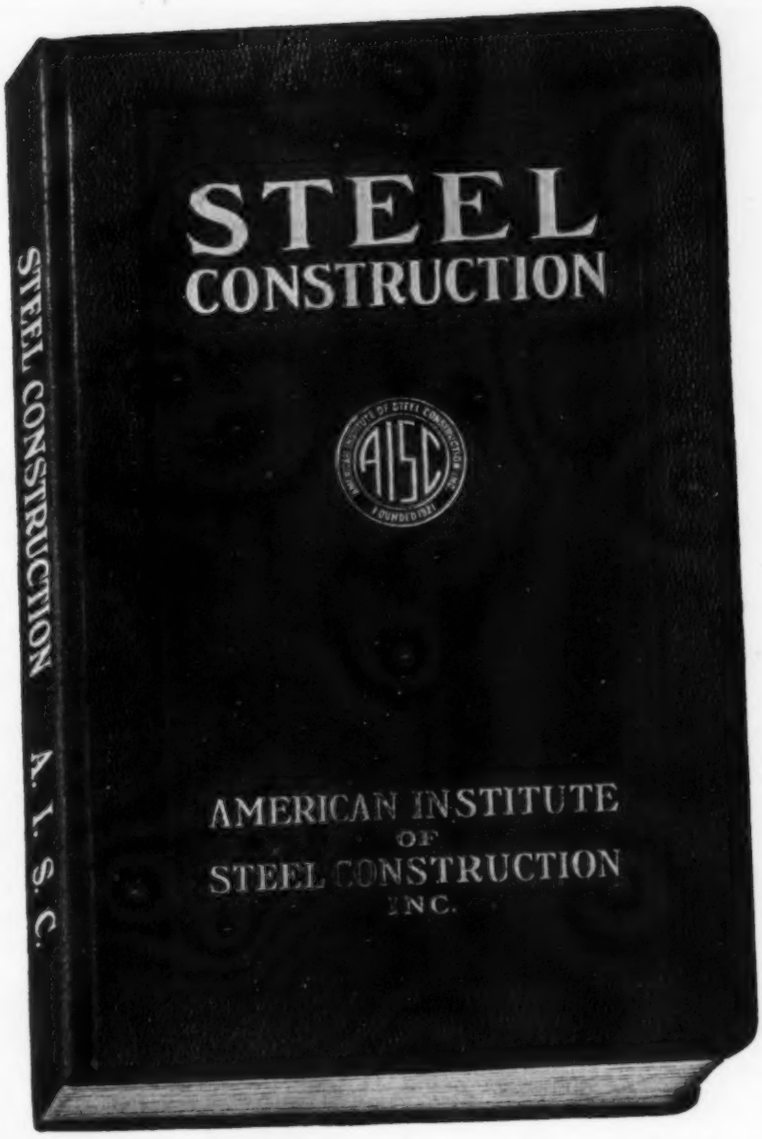
To further assure this shovel-crane against the ravages of constant tough usage, SKF Self-Aligning Ball Bearings are used—and the high-pressure lubricating system adds another wear-defeating advantage.

When you compare all the advantages of the *American Gopher* over other machines of the same capacity on the market, check the price. You cannot get more per dollar anywhere, as our new catalog will show. Send for it.

Chicago
Seattle
Pittsburgh
New York
St. Louis
New Orleans
Indianapolis
San Francisco
Birmingham
Detroit
Los Angeles

AMERICAN HOIST & DERRICK COMPANY
71 South Robert Street
ST. PAUL, MINN.

"AMERICAN GOPHER"
Shovel-Crane



A BETTER KNOWLEDGE OF STEEL

HERE is a handbook that should be on the desk of every engineer . . . that should be within reaching distance of every architect . . . that should be the first thought of everyone who works with steel. A new kind of steel handbook . . . more usable . . . with all essential data instantly available . . . comprehensive, complete, compact. Forty thousand copies have gone into circulation since its publication a year ago. It is used as a text in 143 technical schools and colleges.

This indispensable book is published by the American Institute of Steel Construction and contains, besides its immensely valuable technical data, other contributions that the Institute has made toward standardization and betterment of structural steel construction. These are The Standard Specification for Structural Steel for Buildings, The Code of Standard Practice and The Standard Specification for Fire-proofing.

No one working with steel can afford to be without this important handbook. It is available from members of the Institute or may be had by sending $1.50 to the American Institute of Steel Construction, 200 Madison Avenue, New York. A coupon is attached for convenience in ordering. Mail it today and a copy of the handbook will be sent to you at once.

AMERICAN INSTITUTE OF STEEL CONSTRUCTION, INC.

The co-operative non-profit service organization of the structural steel industry of the United States and Canada. Correspondence is invited. 200 Madison Avenue, New York City. District offices in New York, Worcester, Philadelphia, Birmingham, Cleveland, Chicago, Milwaukee, St. Louis, Topeka, Dallas and San Francisco.

STEEL CREATED THE SKYSCRAPER

STEEL INSURES STRENGTH AND SECURITY

CM-4

American Institute of Steel Construction, Inc.
200 Madison Avenue, New York City

Enclosed is $1.50, for which please send me a copy of the Handbook of Steel Construction.

Name_____

Address_____

What more is there to say?

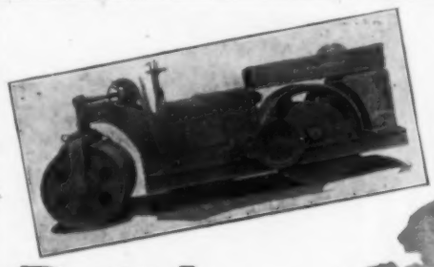
"The men at this property claim that they have tried, at different times, to stick the H7, but have failed. They certainly have been advertising our H7 to others, stating that the Cleveland H7 is the best all around drill they have ever run."

We'll demonstrate this truth at your convenience. Write—

The Cleveland Rock Drill Co.
3734 E. 78th St., Cleveland, Ohio

Branches, Agents and Service Stations in Principal Cities and Mining Centers of the World.

Specifications of Cleveland Drills, Pages 150-151, Keystone Metal Quarry Catalog.



Buffalo-Springfield ROLLERS

The wide spread adoption of Buffalo-Springfield Rollers can mean only one thing—that the builders of our roads and streets consider them the most practical and the most dependable rollers on the market. It is the old adage, "values will tell" reasserting itself.

All practical sizes, both steam and motor driven. Scarifiers and other special attachments when desired.

When in the market, investigate the Buffalo-Springfield. Write for illustrated booklet describing the entire line.

The Buffalo-Springfield Roller Co.
Springfield, Ohio

A Sensational Performer and Money Saver

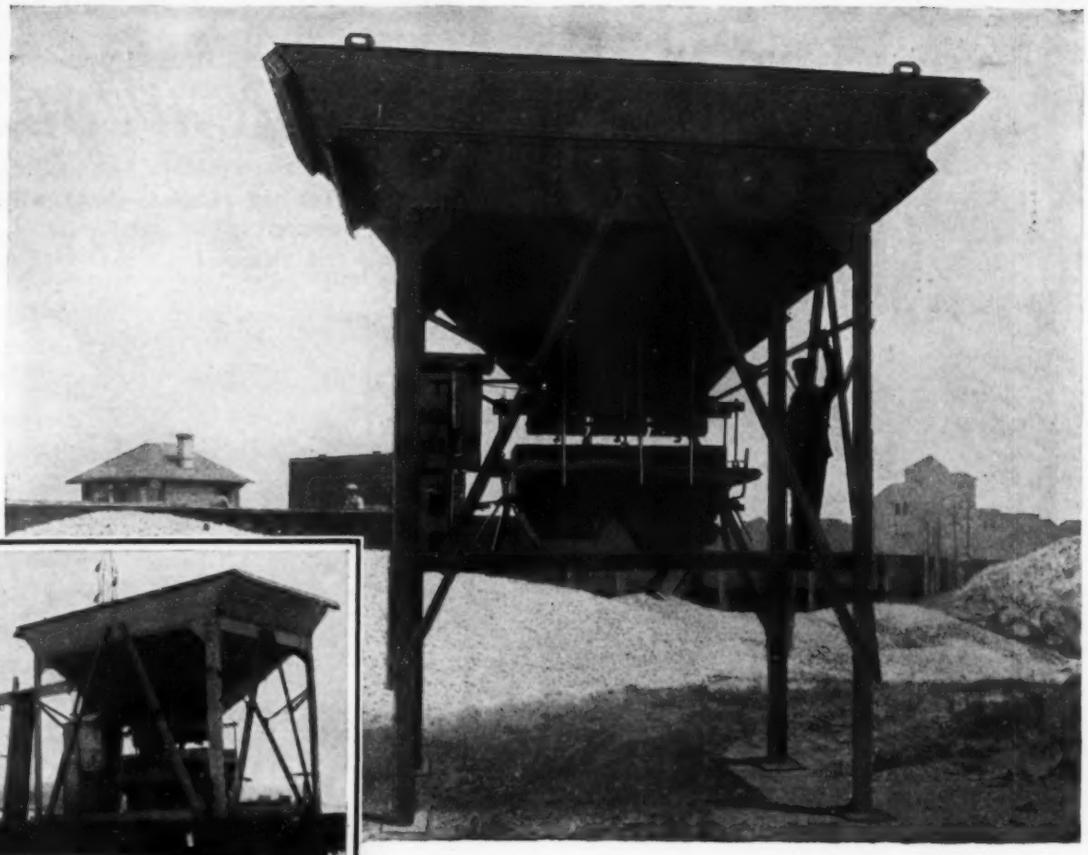
THE speed, versatility, rugged construction, big yardage and low cost of the Fundom combination shovel, ditcher and crane, make it a sensational performer and money saver.

It makes small jobs profitable. Fast, full ¾ circle swing, 1/3 yard dipper capacity, 16½ foot radius, gasoline power.

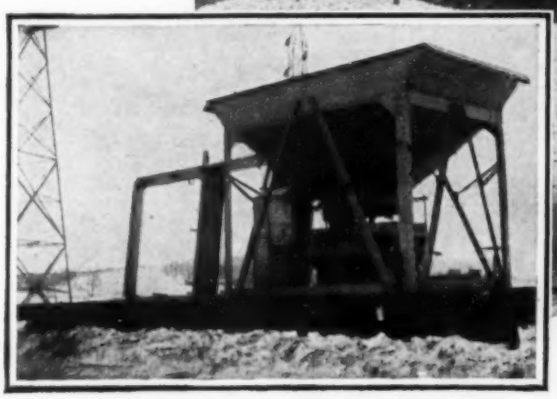
With Trench Hoe attachment for ditching or Boom Extension for clamshell, dragline or crane, the Fundom is an unbeatable three-in-one digging machine.

Get the details and name of nearest dealer. Address—

The Fundom Hoist & Shovel Co.
314 Central Building, Lima, Ohio



Note how little room is required on a flat car for shipping the "V" 36. You can often save transportation charges on long moves because there is room for all other equipment on the same car.



The New V 36 Bin

THE new Butler "V" 36 cubic yard bin is especially designed and adapted for use by contractors where portability and convenience of handling are all-important features and where sufficient storage capacity must be provided to take care of the average job.

In moving the bin from one set-up to another, it is only necessary to lift off the top section—which is in one piece—no bolts to take out, as this part interlocks with the main portion of the bin. Unbolting the four columns and eight knee-braces reduces the balance of the bin to such size that it ships on a railway car or can be handled on a truck.

The weighing hoppers and scales or volume measuring hoppers remain intact and no part need be removed or altered. For overhead operation the lower bin bracing may be utilized for attaching of platform—or ground operation may be easily arranged for either type of proportioning equipment.

BUTLER BIN COMPANY, WAUKESHA, WIS.

Representatives in *Fifty Principal Cities*

BUTLER
Steel BINS

Protect yourself!

with simple and direct

LIGHT

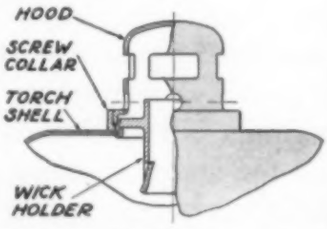
from a dependable source

in other words always use the

TOLEDO TORCH

PRETTY colored lanterns may get you by with cautious drivers, if you hire a watchman to keep them on the job. But it's the reckless ones who cause all the accidents. With them the use of uncertain signals, such as red lanterns, is a needless risk for you to take, especially when it is so much more costly than using TOLEDO TORCHES.

The New TOLEDO TORCH is dependable in all kinds of weather, is very economical in the use of fuel, and is never molested by petty thieves. The secret of its great success lies in the new ECONOMY BURNER. *(Patents Pending)*



IT is the only burner that will give you satisfactory service at all times. Observe carefully its construction, and *insist on having the genuine.* Similar looking imitations do not compare in performance.

Ask for the 'Champion'

"the harder it blows the better it burns"

Made only by

THE TOLEDO PRESSED STEEL CO.
TOLEDO, O.

ACCEPT NO SUBSTITUTE

Sterling

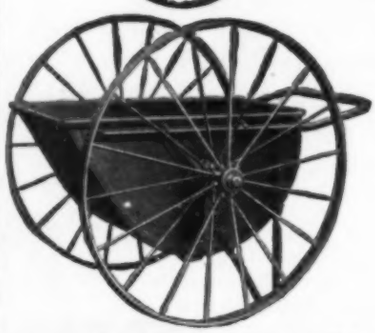
—carries big stocks—centrally located for prompt shipment. Buy Sterling next time—*they cost less to use.*

No. 6A—A.G.C. for dry material. Capacity 3½ cu.ft. *All Sterling barrows have reinforced tray tops and corners.* This is the most popular general type barrow.

No. 31—large concrete or wet material. Capacity 4 cu.ft. struck. *The easiest wheeling big load barrow made.* Will outlast others in toughest work.

No. 10A—wide tray, capacity, 4½ cu.ft. A.G.C. standard. Fits all contracting requirements and *built to give the longest service.* Solid and strong.

No. 61—extra narrow deep tray, capacity 3½ cu.ft. for concrete, mortar, etc. A type that will cost you *less to use* because it will last longer.



No. 6—the *strongest built cart* on the market. Full capacity body, no axle inside. Capacity 6 cu.ft. or 1200 lbs. Perfect balance and easiest wheeling. 42-in. wheels.

The above is but a few of the many, many Sterling types—write for complete catalog. Buy by Sterling name—leading hardware and equipment dealers have them or they can get them quickly from our complete stock warehouses at Chicago, New York, Philadelphia, Pittsburgh, Cleveland, Detroit, St. Louis.

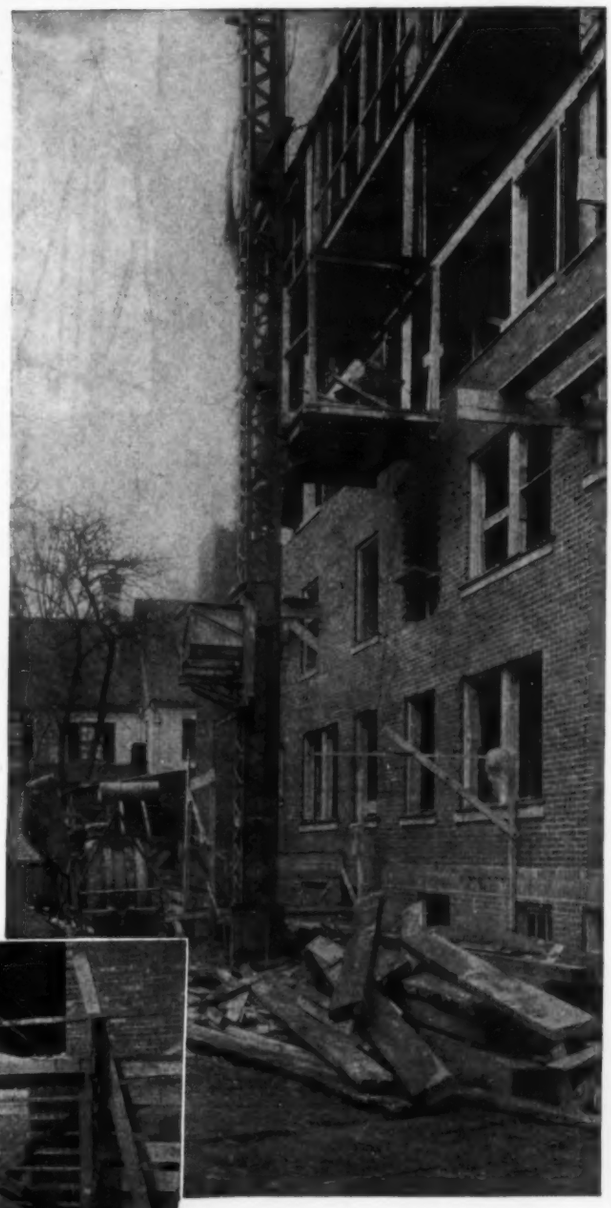
STERLING WHEELBARROW COMPANY
Milwaukee Wisconsin

Hoists Everything on the Job

IF YOU had an Insley Mast Hoist you would set it up on concrete jobs to hoist concrete. If you had no concrete on the job you would set it up to hoist brick, tile and reinforcing steel. It is equipped with a bucket to hoist concrete, a material elevator to hoist wheelbarrows of brick, and a Chicago boom to hoist steel. If you had an Insley Mast Hoist you would use it on every job you had.

Think of it. Here you have one plant to perform every hoisting function on the job, to handle everything that has to be lifted. Every time you set it up it saves a lot of money by eliminating extra cages, auxiliary hoists, and gin poles. Its first cost is very little more than makeshift equipment, its erection cost is negligible, and it fits every job you have in one form or another.

Furthermore, if you had an Insley Mast Hoist you would use it on every job you had.



Above—Hoisting tile and concrete at the same time.

Left—A double elevator plant hoisting brick.

INSLEY

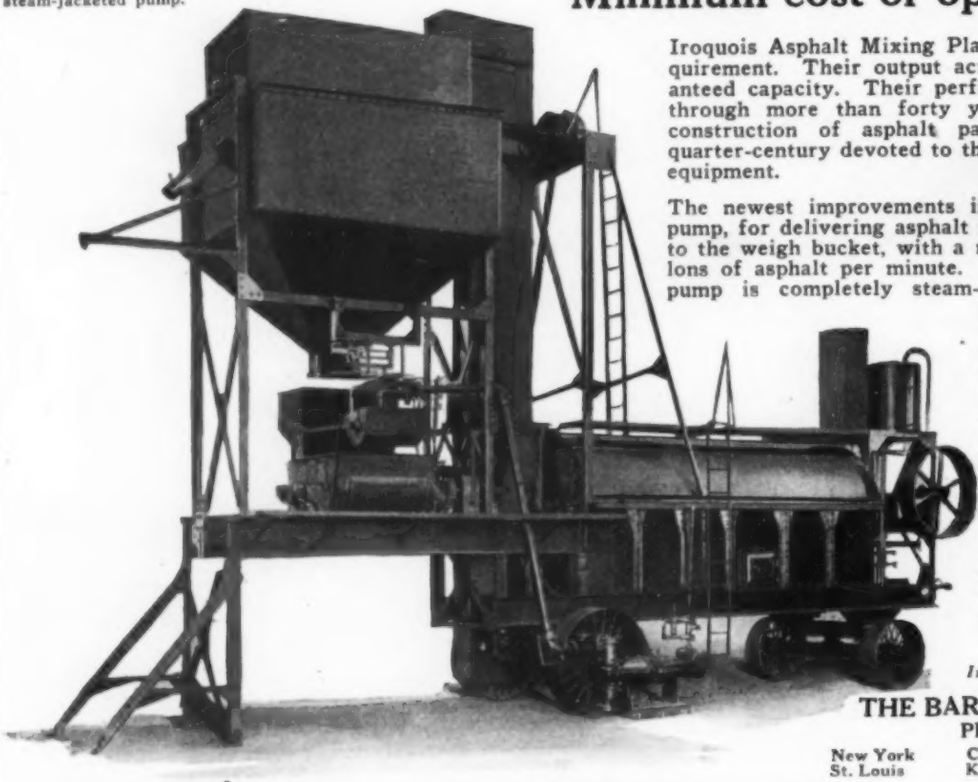
MANUFACTURING COMPANY — INDIANAPOLIS

ENGINEERS AND MANUFACTURERS

716

Division of National Equipment Corporation

Illustration shows the Iroquois Three-Unit Portable Asphalt Mixing Plant, with guaranteed capacity of 1,500 square yards of 2-inch sheet asphalt topping per day. Note arrangement of steam-jacketed pump.



Greatest capacity Fastest mixing
Minimum cost of operation

Iroquois Asphalt Mixing Plants fully meet every requirement. Their output actually exceeds the guaranteed capacity. Their perfection has been attained through more than forty years' experience in the construction of asphalt pavements—more than a quarter-century devoted to the designing of necessary equipment.

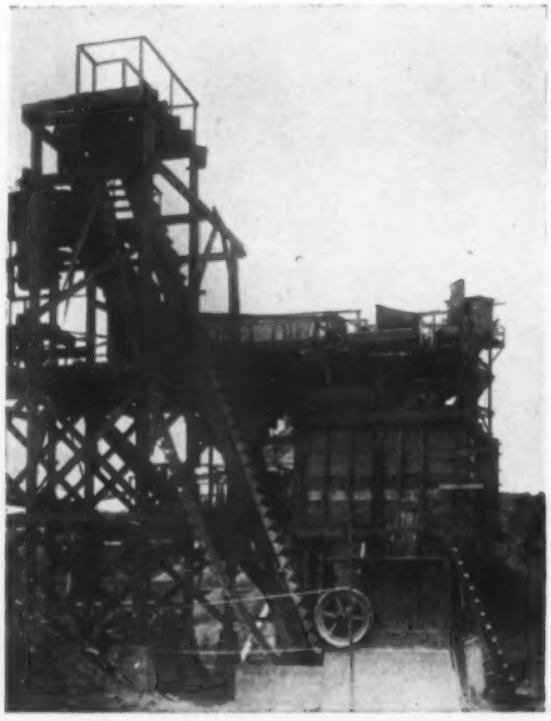
The newest improvements include a steam-jacketed pump, for delivering asphalt from the melting kettles to the weigh bucket, with a rated capacity of 50 gallons of asphalt per minute. The asphalt end of the pump is completely steam-jacketed and has only three moving parts.

Iroquois Asphalt Mixing Plants are made with guaranteed capacities of 400, 1000, 1500 and 2000 square yards. Portable or stationary; electric or steam driven. Write for full details; also for information about the entire Iroquois Line—driers, rollers, paving tools, and all street-paving and road-building equipment.

Iroquois Sales Department

THE BARBER ASPHALT CO.
PHILADELPHIA

New York St. Louis | Chicago Kansas City | Pittsburgh San Francisco



Good Roads MACHINERY

MODERN-DEPENDABLE MACHINERY

for the ROCK PRODUCTS—SAND and GRAVEL Industries.

—CHAMPION ROCK CRUSHERS—
Primary Type 7½-in. x 13-in. to 22-in. x 50-in.

Roller Bearing Reduction Crushers—
10-in. x 20-in., 10-in. x 28½-in. and 10-in. x 40-in.
Equipped with SKF self-aligning roller bearings—
Alemite lubrication.

ELEVATORS, CONVEYORS, SCREENS, WASHERS, FEEDERS. The designing and erection of complete plants.

The GOOD ROADS MACHINERY COMPANY, Inc.
—Division of Crusher Equipment—

KENNETT SQUARE, PA.

New York Philadelphia | Watertown, Mass. | Pittsburgh | Chicago Los Angeles

"I want the FACTS About Thor Compressors"

"I've Heard So Much About Them and the *Super-Charger* That I am very much Interested"

The Thor 250 ft. rated capacity compressor. Note the sturdy design, low slung balance and one piece steel frame which minimizes vibration. Actually delivers 210 ft. of air per minute.

So Said a Contractor and Here They are-

JUST FACTS

The Thor 116 cu. ft. rated capacity compressor. Easy accessibility of all working parts and simplified construction are features of Thor design. Actually delivers 96 ft. of air per minute.

You have always bought compressors on the statement of "this compressor is rated at, or has a capacity of 110 cu. ft. of air per minute," or whatever size you are figuring on. But "CAPACITY" or "RATING" and "ACTUAL DELIVERY OF AIR" are two different things. "Capacity" or "rating" means that IF there wasn't any clearance loss, valve slippage, excess tension of springs, piston leakage, humidity, the compressor would then deliver 110 cu. ft. of air per minute.

HOWEVER, NO COMPRESSOR EVER DELIVERS AN AMOUNT OF FREE AIR EQUAL TO ITS DISPLACEMENT. The actual delivery of air ranges from 60 to 70% of the "capacity" or "rating."

AND THAT IS WHY THOR COMPRESSORS HAVE THE SUPER-CHARGER. The Rix Super-Charger counter-acts these various losses by making the Thor unit about 83% efficient. The Thor 116 ft. rated compressor actually delivers 96 cu. ft. of air. Other compressors of 110 ft. rating deliver only 66 to 77 cu. ft. of air. The Thor 250 ft. rated compressor actually delivers 210 cu. ft. of air. Other compressors rated at 250 ft. deliver only 150 to 175 cu. ft. of air. DO YOU SEE THE DIFFERENCE?

The Rix Super-Charger is an exclusive, patented feature of the Thor that utilizes the idle or downward stroke of the piston to compress the additional air the Thor delivers.

The Thor is the lightest, most compact and most powerful compressor of its size on the market. As it has no clutch, no coupling, no gears, it is the simplest unit made, with a record for low upkeep cost. The Thor is direct-connected, both engine and compressor being mounted on a common crank case.

Cast steel is used in the frame of the Thor in place of structural steel, as it eliminates useless weight and minimizes vibration.

The Thor is made in two sizes, 116 ft. and 250 ft. rated capacities and in numerous styles and mountings to suit individual needs.

You owe it to yourself to at least investigate Thor Compressors. The saving involved is well worth the time spent. Complete information and specifications are yours for the asking.

INDEPENDENT PNEUMATIC TOOL CO.

PNEUMATIC TOOLS

246 South Jefferson St.
Chicago, Ill.

ELECTRIC TOOLS

6 in 1

Dig-Load-Haul-Dump-Spread-Compact

A Train of Baker Maney Scrapers

Digging in under the pull of the heaviest tractors — heaping pans loaded up to the cross-bars—trailing along over the roughest ground and taking the sharpest turns—instant, clean dumping—each layer compacted by the wide, heavy scraper wheels. A complete job done by a single Baker Maney outfit.

Baker Maney Scrapers have proved their worth over a period of 17 years in all parts of the country and in 22 foreign lands. Investigate Baker Maneys now.

BAKER MANEY
Self Loading Scrapers

—and consider the outstanding

BAKER ONE-MAN ROTARY SCRAPERS

For your short hauls. Made in 4 sizes for any tractor. Entirely automatic.

Send for the following catalogs:

Baker Maney Scrapers ☐

Baker Rotary Scrapers ☐

The Baker Manufacturing Co.
568 Stanford Avenue, Springfield, Illinois

LASTING AND BETTER CURING WITH

GRASSELLI R-B

SILICATE OF SODA

When you use Grasselli "R-B" for curing concrete roads and streets, you reduce your overhead by eliminating the largest part of the curing gang. Two men with brooms or spray rig do the whole job without dirt, delay or argument.

Brooming "R-B" on road surface

Spraying "R-B" on concrete base

You owe it to yourself and to the public to get complete information on this latest and approved method that insures better roads at less cost.

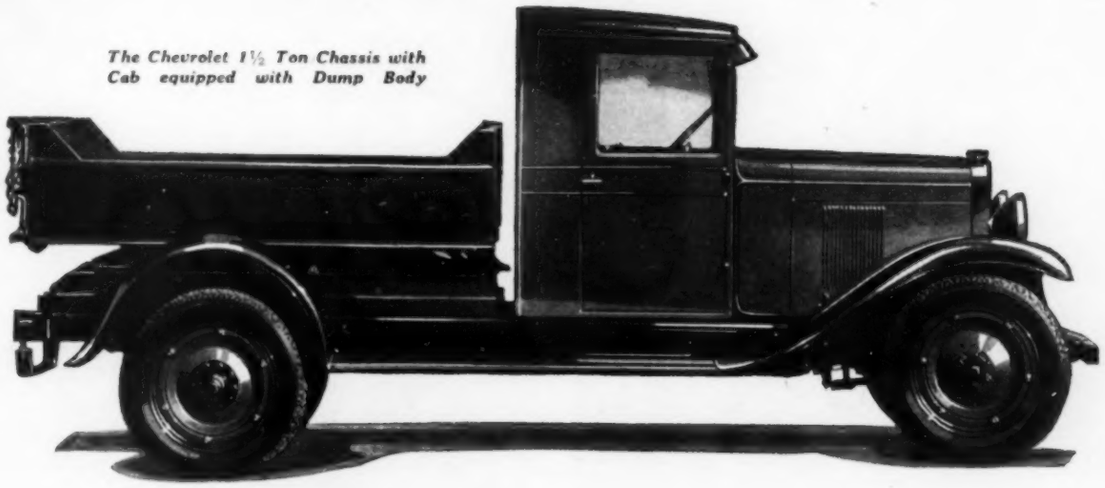
Literature showing how "R-B" saves time, work and expense will be gladly sent on request.

THE GRASSELLI CHEMICAL CO.
Founded 1839 Incorporated
Cleveland, Ohio *Branches in 18 cities*

GRASSELLI GRADE
A Standard Held High for 90 Years

for Economical Transportation

CHEVROLET



The Chevrolet 1½ Ton Chassis with Cab equipped with Dump Body

A Six-Cylinder Truck with the Economy of the Four . . . Ideal for Contractors

Offering all the brilliant performance advantages of a great new six-cylinder valve-in-head engine—yet amazingly economical, both to own and to operate—the new Chevrolet trucks are meeting with unrivaled popularity among users in every line of business.

Never before has Chevrolet's leadership in quality and value been so decidedly pronounced. Six-cylinder performance—with its greater reserve power, higher speed, faster acceleration and smoother operation! Marvelous handling ease—the result of a full ball bearing steering mechanism, powerful 4-wheel brakes, and a positive, smooth-acting dry disc-clutch! Rugged dependability—assured by a heavy channel steel frame, massive banjo-type rear axle housing and scores of additional features of advanced design! And all *available in the price range of the four.*

See your Chevrolet dealer today. He can provide you with a Chevrolet six-cylinder truck designed especially for your business that will combine dependable six-cylinder transportation with the outstanding economy of the four!

1½ Ton Chassis	$545
1½ Ton Chassis with Cab	$650
Sedan Delivery	$595
Light Delivery Chassis	$400

All prices f.o.b. factory Flint, Michigan

CHEVROLET MOTOR COMPANY, DETROIT, MICHIGAN

Division of General Motors Corporation

A SIX IN THE PRICE RANGE OF THE FOUR

Starrett Transits

Transit 99B
Plain sight tube, extension legs, ground level vial.....$40.00

Transit 99F
Telescope, extension legs, ground level vial.....$40.00

Leveling Instrument 101A
Plain sight tube, extension legs, plain level vial.....$15.00

Leveling Instrument 101C
Telescope, extension legs, ground level vial.....$25.00

Wood Leveling Rod and Target...$5.00

Iron Target, without rod.....$1.50

Built by the World's Greatest Toolmakers to give practical men a practical, low cost instrument of lasting accuracy and dependability.

Write for free copy of the interesting and informative Starrett Transit Book No. "NF".

THE L. S. STARRETT CO.
World's Greatest Toolmakers
Manufacturers of Hacksaws Unexcelled
Steel Tapes—Standard for Accuracy
ATHOL, MASS., U. S. A.

Use Starrett Tools

2491

You'll make more money with

Killefer Road Rippers!

Our No. 10 Road Ripper above is 10″ deep breaking out 3″ of asphalt macadam on 7″ of rock ballast. All to be windrowed by grader and loaded out by power shovel for re-processing. These tools are fast and economical

For rough scarifying - -

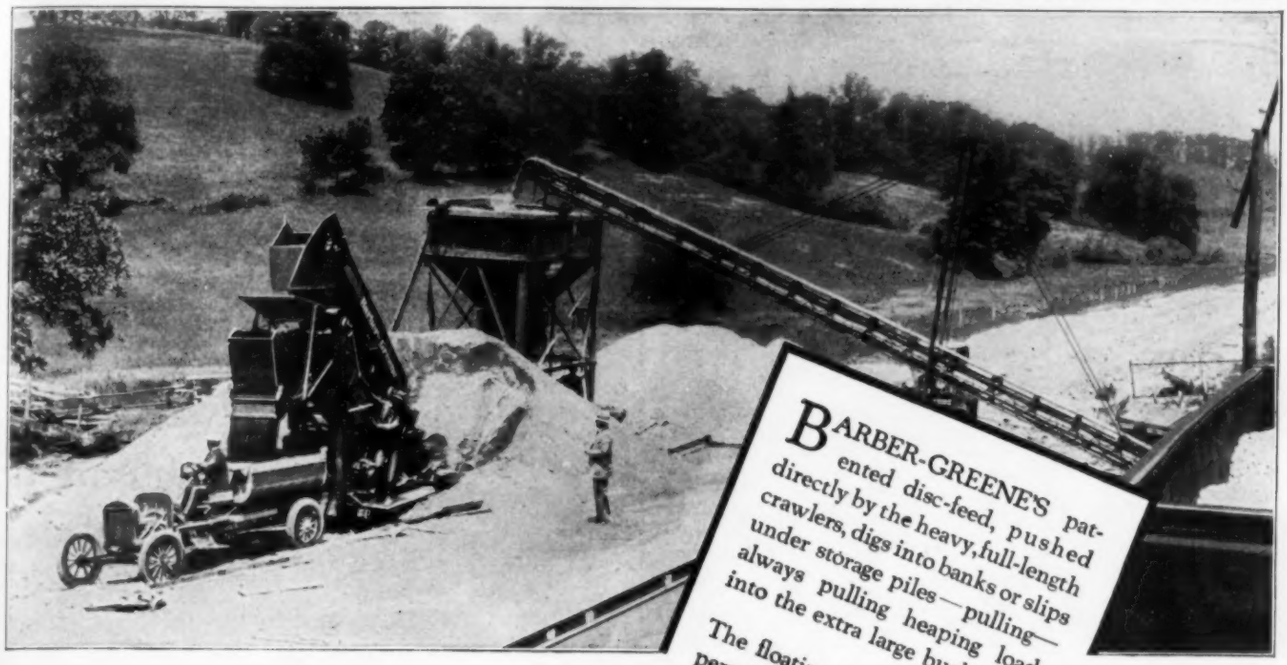
Breaking out material for scraper, grader or bull-dozer - -

For subgrade bonding -

For road re-building - -

Folder R 942 tells the whole story. Write to Killefer Mfg. Corp., 5525 Downey Road, Los Angeles, Calif. We also manufacture a full line of drag scrapers; also a scarifier for sub-grade work and packed snow and ice in street and gutter. Sales agencies thruout the United States and Canada.

DISC-FEED . . . . . FLOATING BOOM . . . . . OVERLOAD RELEASE



BARBER-GREENE'S patented disc-feed, pushed directly by the heavy, full-length crawlers, digs into banks or slips under storage piles—pulling—always pulling heaping loads into the extra large buckets.

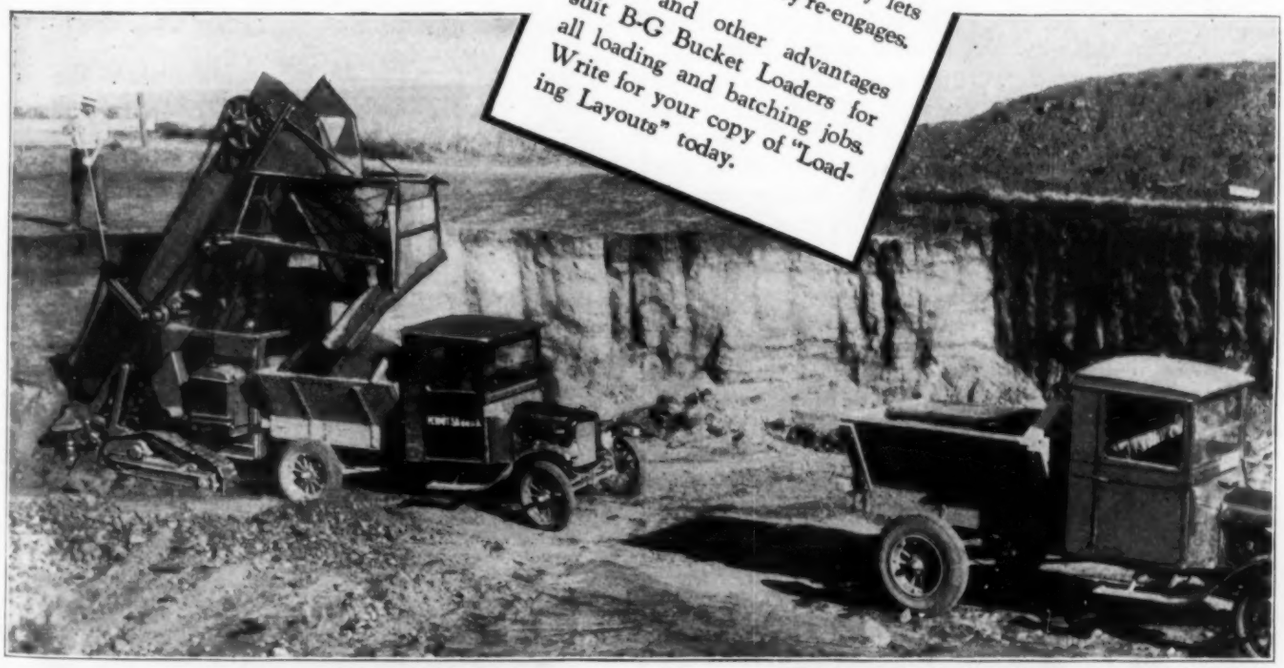
The floating boom, (patented), permits a direct push from the chassis, and lets the disc-feed follow the contour of the ground for a clean pick-up.

And the spring overload release—with no clutch to slip—no bands to wear—no bolt to replace—automatically lets go and automatically re-engages.

These and other advantages suit B-G Bucket Loaders for all loading and batching jobs. Write for your copy of "Loading Layouts" today.

From
Storage or Bank—
Smooth or Uneven
Ground

THREE LOADERS:
the "42"—the "25"—
the "28"—for every job



BARBER GREENE

BARBER-GREENE COMPANY

530 W. Park Avenue, Aurora, Illinois

Keep a Strangle Hold on the Time Limit

CONTRACT dates have a way of creeping forward and becoming due all too soon.

Schramm Compressors have in nearly every phase of construction work proven their excellence by furnishing that unfailing power which is so necessary in completing jobs economically.

A Schramm satisfies the contractor and operator.

Here are some of the reasons for such satisfaction:—

Flexible Clutch Coupling — permits the engine being started free from the compressor load.

Powerful Buda Engine—nationally known for unfailing performance.

Simply designed compressor—larger capacity.

Positive pressure control—assuring uniform pressure.

Air tank standard A.S.M.E. riveted.

Sizes—1 up to 360 cu. ft. Gas, electric or belt drive. Truck, trailer, skid or tractor mounted.

Get the Catalog.

SCHRAMM, INC.
West Chester, Pa.

Distributors and Representatives in All Principal Cities

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Metaforms

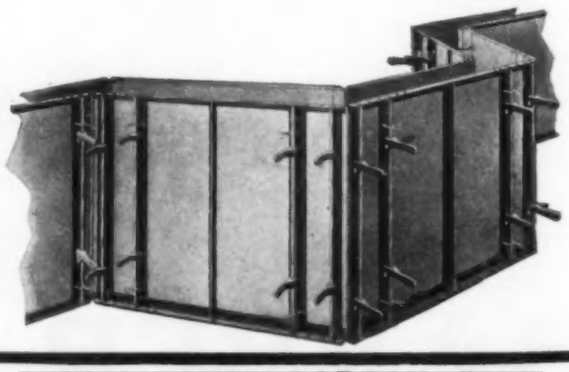
for every form building requirement

Erected in less than half the time with only unskilled labor

WHERE wood forms take days to build and put in place, Metaforms may be erected in a few hours. Where skilled labor and expensive lumber are required for wood forms Metaforms are easily put in place with unskilled labor.

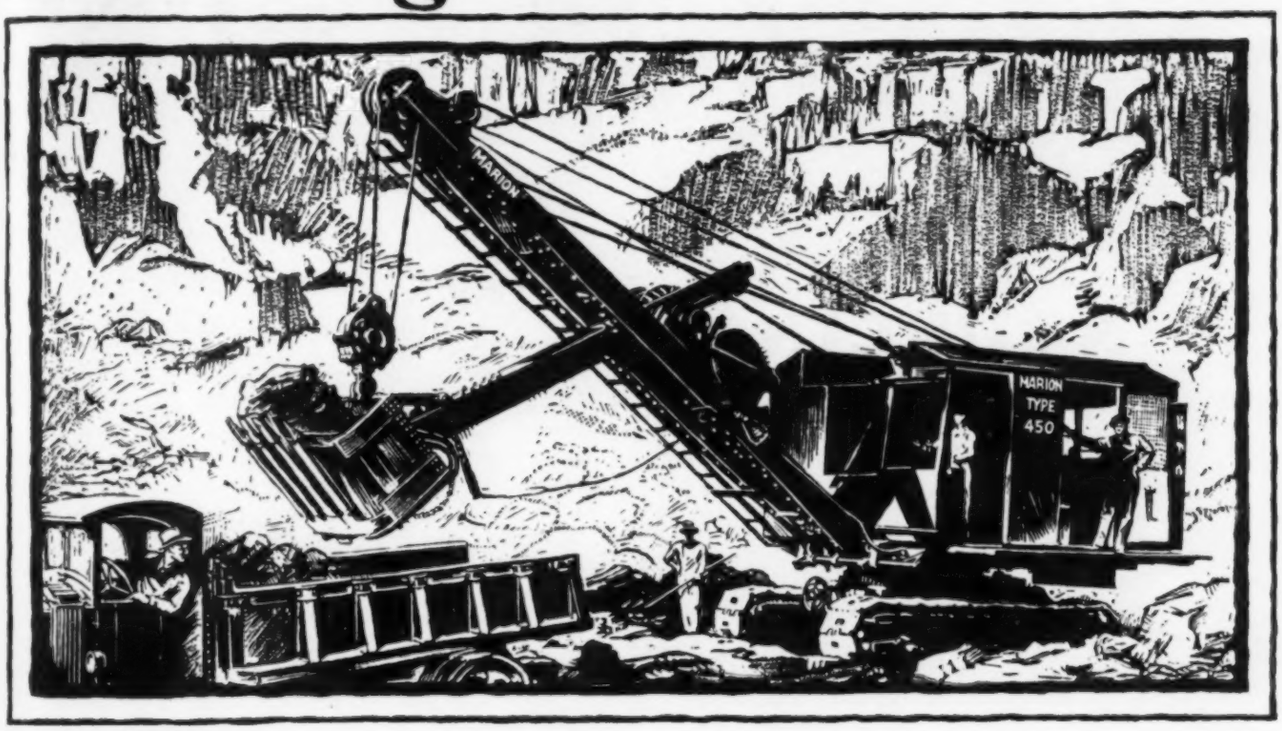
These two facts alone would mean the difference between a nice sized profit on a Metaform job and doubtful returns without them, but there are other advantages—features not found even in other ready made forms—that add to the savings made with Metaforms.

Let us send you a catalog of stock forms and illustrations of work they will do.



METAL FORMS CORPORATION
Milwaukee, Wis.

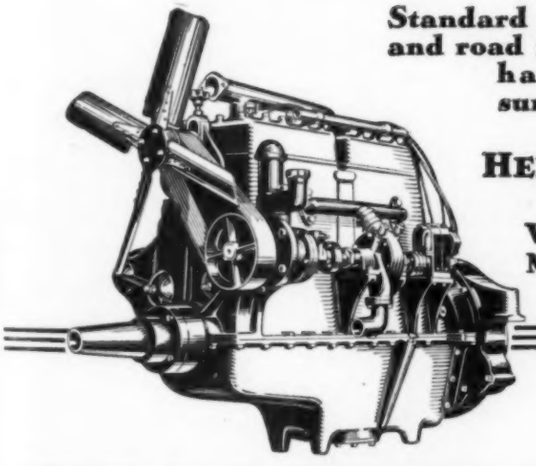
Policing the Palisades



with a Hercules Powered Shovel

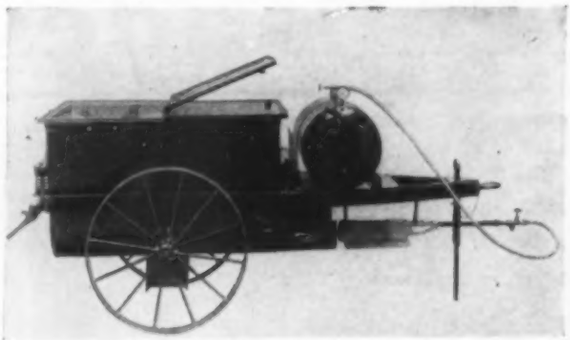
Huge glacial spalls—hundreds of thousands of tons of eroded rock and soil—the debris of centuries—are yielding to the relentless jaw of a Hercules powered Marion Shovel detailed to cleaning up the Hudson River shore at the foot of the Palisades. Bucking the hardest kind of trap rock digging this machine is making record time—a tribute to the staunchness and reliability of Hercules Engines.

Standard on many types of highway constructing and road maintenance equipment, Hercules power has earned an enduring reputation for surer, better and quicker service and results.



HERCULES MOTORS CORPORATION
CANTON, OHIO, U.S.A.
West Coast Branch : Los Angeles, Cal.
Mid-Continent Branch : Houston, Texas

HERCULES ENGINES



ANNOUNCING

The Hauck Oil Burning Asphalt Kettles

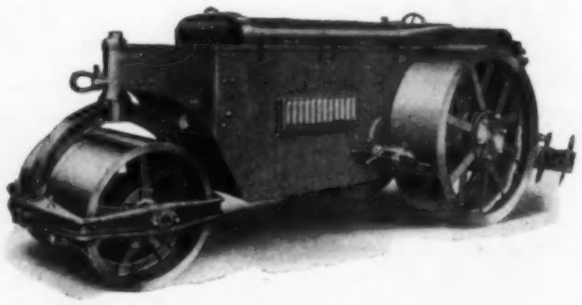
built by Hauck with the usual Hauck quality and satisfactory service. A fast melter, i. e. 50 gallons of asphalt in 25 minutes.

Send for special bulletin illustrating its many features of construction, sturdiness, dependability, heat control, etc.

Hauck Manufacturing Co.

Mfrs. of Oil Burners and Oil Burning Equipment since 1900

147 Tenth Street, Brooklyn, New York



AMES 6 CYLINDER, TEN TON ROAD ROLLER

The public interest this new equipment has aroused has surpassed our fondest hopes. We receive daily hundreds of letters from dealers and prospective purchasers everywhere asking for more information, prices, agencies, etc. All of which only substantiates our early claim, "that the roller buying public have been waiting for an honest to goodness 6 cylinder roller." *We have it.* Certainly it costs more, why shouldn't it? But it's worth double. It's built by

Bulletin Sent on Request Get yours

AMES IRON WORKS DIV.

of PIERCE, BUTLER & PIERCE MFG. CORP.

OSWEGO, N. Y.

Lots of interesting features

KOLESCH

Some Leaders in a Leading Line

Surveying Instruments
Blue Print Paper
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KOLESCH & Co., 138 Fulton St., New York City.
Send me your Price List and Catalog, and put my name down gratis for future copies.
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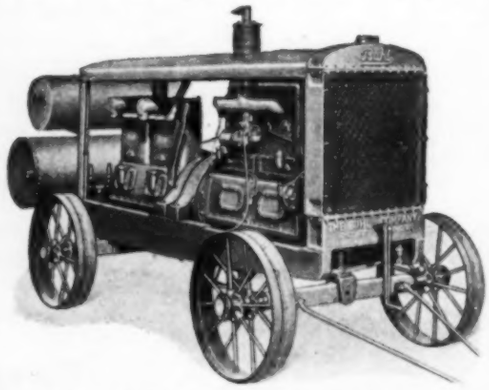
Air At Lower Cost



With BUHL Compressors

The new line of BUHL embodies all of the latest improvements possible in air compressor construction which result in unheard of economies in compressed air cost, increased life of the compressor and exceptional dependabilities.

The new Buhl is "Years Ahead" in air compressor design and is made in **36, 55, 90, 100, 110, 220 and 330** cu. ft. displacements. Can be supplied with any mounting desired.

Write for Descriptive Literature. Address

The BUHL Company

General Offices:
Old Colony Bldg., Chicago

THIRTY-SIX PLYMOUTHS HAVE HELPED BUILD WAYNE COUNTY MICHIGAN ROADS

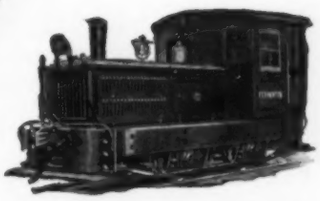
Having carried on a consistent road building program for the past eighteen years, the Wayne County Road Commissioners have developed one of the largest road building organizations in the world.

Their building program has averaged fifty miles of new roads in the past six years—mostly hard surface roads, and nearly all twenty feet wide. This is in addition to replacements, repairs and the widening of an average of twenty miles of old roads per year.

Thirty-six Plymouth Gasoline Locomotives have reduced their haulage cost and increased their yearly mileage by placing materials on spot, rain or shine.

GASOLINE PLYMOUTH LOCOMOTIVES

If It's a Track Haulage Problem There's a PLYMOUTH to Solve It



The PLYMOUTH 25-ton gasoline locomotive specially built for heavy hauling and shifting.

PLYMOUTH LOCOMOTIVE WORKS
The Fate-Root-Heath Company
PLYMOUTH, OHIO

PLYMOUTH
Gasoline Locomotives

COLUMBIA ③ Brand Calcium Chloride For CURING CONCRETE

A simpler and more practical method of curing concrete road is provided by "3-C" Calcium Chloride.

The superiority of Calcium Chloride over other curing methods has been proved, convincingly, by hundreds of thorough and carefully conducted tests by many authorities.

Concrete road cured by "3-C" Calcium Chloride is stronger and may be opened to traffic after 7 days, instead of requiring 21 days as with old methods.

Here is a valuable saving of time and money—a vital factor in road building. Send the coupon today for complete information.

THE COLUMBIA PRODUCTS CO.

BARBERTON, OHIO

Manufactured by
COLUMBIA CHEMICAL DIV.
Pittsburgh Plate Glass Co.

The Columbia Products Co.,
Barberton, Ohio

Please send complete information about the advantages of using "3-C" Calcium Chloride for Curing Concrete.

Name.....

Street.....

City.....

CM 429

O. K.

AIR COMPRESSORS KEEP AIR TOOLS HUMMING!

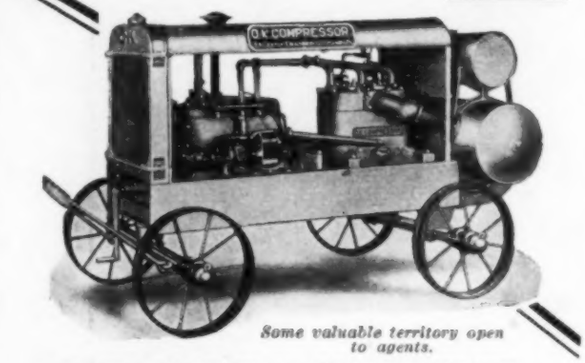
OK

THERE'S a need every minute of the day for a good air compressor—and we've made the O. K. good on purpose to give the most air for your money on portable jobs.

And the O. K. Portable Air Compressor is powerful—a four-cylinder engine, with special device for idling if the load is cut off. There's an O. K. clutch for starting the engine separately. There's a new type radiator, special valves—and other improvements we'll be glad to tell you about if you'll write.

At the same time ask about

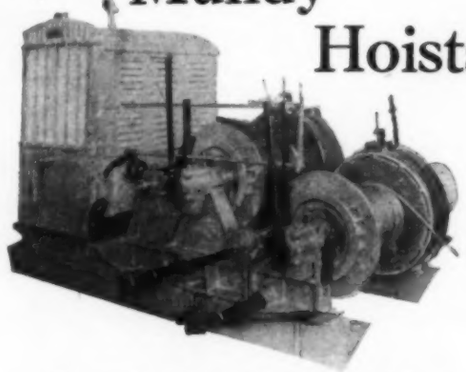
O. K. Portable Hoists and O. K. Portable Elevators



Some valuable territory open to agents.

O. K. CLUTCH & MACHINE CO.
P. O. BOX 305, COLUMBIA, PENNA.

Mundy Hoists



Standard of the World

Gasoline—Electric—Steam

Built up to a standard
Not down to a price.

Car Pullers—Cableways

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TRADE MARK
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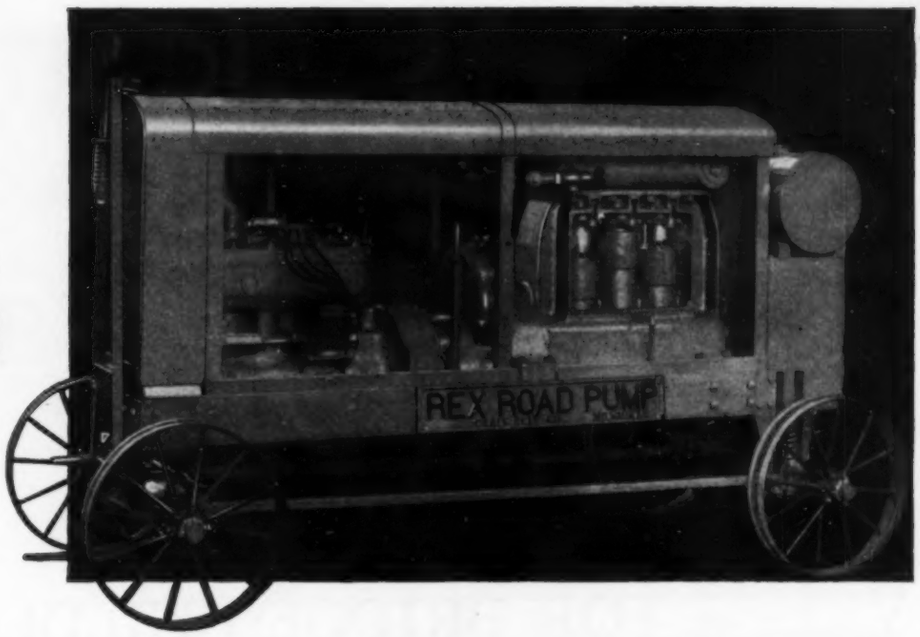
No Paver Need Wait Nor Stop



AND NOW THE REX ROAD PUMP HAS EXCLUSIVE TWO-PIECE PLUNGERS

The last two years prove that the radically new automotive design of the Rex road pump plays an important part in making road paving profits.

For the Rex Pump is built only with the idea of matching in performance the Finest, Fastest Paver ever Built.

The reasons for Rex performance are simple if you examine the radically new design and construction. The pump is on the automotive principle. Plungers travel up and down instead of horizontally.

That means new smoothness, new compactness, and new "get-at-ability."

Force-feed lubrication can be utilized to solve completely the important problem of oiling. And repairs and adjustments can be made minutes and hours sooner than is humanly possible on old-fashioned construction. Chain Belt Company 764 Park Street, Milwaukee, Wis.

REX PUMPS

(Reg. U. S. Pat. Off.)

News! News! News!

Rex pioneers the two-piece pump plunger. That puts chilled iron in contact with the water. Sand, dirt, etc., will not wear chilled iron rapidly. In addition, the two-piece plunger can be changed without taking down the pump. Just one more feature wherein Rex leads. Ask about it.

CHAIN BELT COMPANY
764 Park Street, Milwaukee, Wis.
Send me Catalogs on the Pumps I've checked:
Rex Road Pump ☐ Rex Centrifugals ☐
Rex Diaphragms ☐ Rex Piston Pumps ☐

Name .....

Address .....

City ..... State .....

or if you want information on type of pumps for particular jobs ask us by letter — no obligation.

FOR BRIDGE BUILDERS

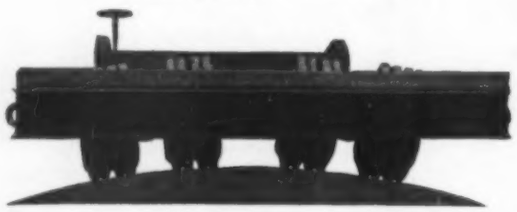
Twenty feet of outside water pressure aided by a "boiling" inside, was strong enough to bend in this line of 12-in. steel sheeting as shown. After the mishap the contractors filled up the outside cavities, and put a complete Moretrench Wellpoint System inside.

That stabilized the bottom—hardened it in fact. all infiltration was intercepted below subgrade —absorbed by the system and fired overboard by the pumps. And the material was blue sandy Atlantic mud full of shells.

The Moretrench Wellpoint System makes "Dry Ones" out of "Wet Ones" under any condition.

MOORE TRENCH MACHINE COMPANY, Rockaway, New Jersey

Look to the Rubber in Buying a Trailer



Tire Capacity Determines Trailer Capacity

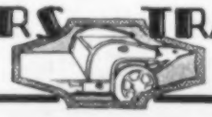
There is practically no limit to the strength that can be built into a trailer frame. The only limitation is the amount of rubber that can be put under it.

Each size of tire is given a definite capacity rating by manufacturers. Obviously, regardless of quoted figures, the true capacity of any trailer never exceeds the actual carrying capacity of its tires.

The capacities of Rogers Trailers are based absolutely on the Guaranteed Ratings of the manufacturers, giving purchasers the greatest capacity per dollar of investment that is obtainable. Ask for catalog and additional information on this subject.

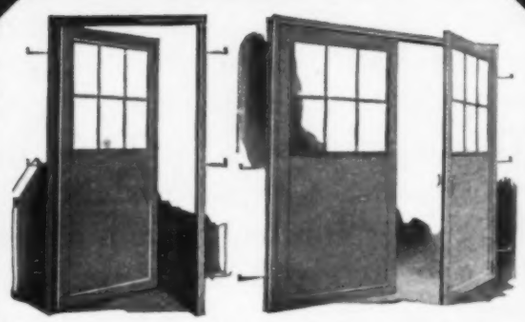
Rogers Brothers Corporation
106 Orchard St., Albion, Penna.

ROGERS TRAILERS



GOOSE NECK — HEAVY DUTY

TRUSCON STEEL DOORS

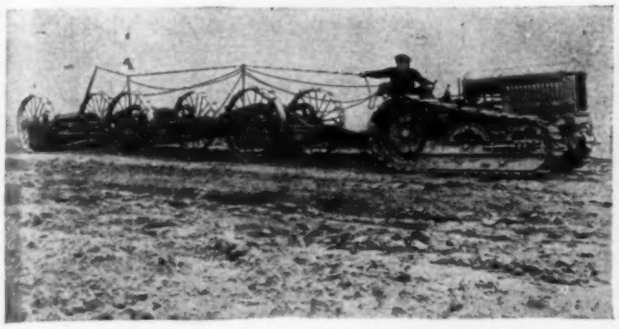


Slide, Swing, Lift, Folding, Lift Swing and Hangar Doors. Standard and Special Types. Rigid, durable and fireproof.

Write for catalog and prices.

TRUSCON STEEL COMPANY
YOUNGSTOWN, OHIO
STEEL DOOR DIVISION
Warehouses and Offices in all Principal Cities

Warm Sunny Days are Coming . . .



The Warco Wheeled Scoop—operated singly or in trains and drawn by a tractor—has never been equaled for amount of work done per dollar of operating expense.

WORK on the roads will soon begin. The time is at hand to order Road Machinery for spring delivery . . . only a few short weeks remain in which to put last year's equipment in order for another season's service.

NEW roads, miles and miles of them, will be built this season . . . old roads must be maintained . . . put into shape for the summer. Work must soon start—don't delay—let us have your order . . . we can best take care of it now.

The new 1929 Warco one-man Grader with new Warco Screw Lift. Write for complete specifications and prices of any type or size Grader in which you are interested. Bulletins on any Warco product may be had for the asking.

A quick and economical job of one-man dirt road maintaining can be done with the Warco ten-ton Road Roller.

Warco KM Alwatracs give perfect traction under conditions where the ordinary wheeled tractor could not be used.

WARCO PRODUCTS

W·A·RIDDELL COMPANY
BUCYRUS·OHIO·U·S·A·

Standard equipment on Warco rear control Graders . . .

The Warco Screw Lift-

"Built Like a Screw Jack."

"DOMESTIC" ROAD BUILDERS PUMP

The Greatest Pump Value on the Market

This GIANT among Pumps is a boon to Road Builders. Strong enough to work 24 hours daily against pressures up to 500 lbs.; large enough to deliver 80 or even 100 gallons of water per minute; so free from bearing friction (ball bearings on all intermediate drive shafts) that the power losses are negligible; so automatically oiled that once a day inspection only is necessary and so rugged that WE GUARANTEE THE MIGHTY CRANKSHAFT AGAINST BREAKAGE FOR ONE YEAR.

This GIANT Triplex Pump has been on the market three years and hundreds are now in use and in only two cases has our unqualified Guarantee of Crankshaft called for replacements. Some of these GIANT Pumps have operated for months continuously, 24 hours a day, 7 days a week, and often at pressure 150 lbs. above our guaranteed pressure of 500 lbs.

No piece of Road Equipment is as Important as the Pump, nor subjected to such gruelling constant duty, so accept no substitutes—insist on a "Domestic" GIANT Pump.

DOMESTIC ENGINE & PUMP CO.
Shippensburg, Pa.

"DOMESTIC"
Giant Triplex Road Pump

These high pressure pumping units are Self-Oiling, Enclosed, Ball Bearing equipped, and are mounted on Spring Trailer Trucks.

Capacity range from 80 to 100 gallons per minute and for pressures up to 500 lbs.

There is a "Domestic" Dependable Pump for every Contractor's needs—write us for descriptive bulletins.

"A 500 lb. pressure pump with the Guaranteed Crankshaft"

CM4-29

M&M CLAMPS
for concrete forms

No special tools required

Perfect and positive adjustment

Save Labor by Using M & M

Wire Clamps
Splicing Clamps
Column Clamps
Tie Rod Clamps
Adjustable Shores
Timber Shores
Screed Gauges
Wire Cutters and Nippers

Send for complete information and catalog

M & M CLAMP CO.
No. 2 S.E. Fifth St., Minneapolis, Minnesota

BULL FROG WHEELBARROWS

Workmen Like This Balanced Barrow

Contractors and others who use this Model 64 Bull Frog with its perfect balance, shaped handles, seamless elevated tray, and "Never Break" Wheel realize how much good design means to a wheelbarrow. Other Bull Frog barrows, carts and scrapers for every mill, mine, contracting and industrial use.

Write for catalog.

THE TOLEDO WHEELBARROW CO.
TOLEDO, OHIO

Branch Office and Warehouse
Chicago: 69 E. Wacker Drive

Porter's sixty-three years specialization in industrial locomotive manufacture, combined with the specialized knowledge of Westinghouse electrical engineers, have developed one of the most advanced types of locomotives ever introduced to industry.

PORTER

GASOLINE PORTER "better built" locomotives ELECTRIC

LOCOMOTIVES

The addition of this type to the famous line of Porter Steam and Gasoline Driven Locomotives places Porter in an unexcelled position to meet any industrial haulage problem no matter how difficult the condition.

H. K. PORTER COMPANY

Established 1865

PITTSBURGH, PENNSYLVANIA

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THE RIGHT TOOL SAVES TIME

AN ALL STEEL FORK

Designed especially for handling asphalt, hot cinders and other hot or rough material. The True Temper Asphalt Fork has nothing to burn or break.

The handle is a steel tube into which the head is securely fastened by a malleable iron wedge and the whole riveted together. It is fitted with an all iron Dee Top. Well balanced, light and easily handled. The tines are spaced ¾" apart, and the end tines are bent upward at the shoulders, to carry a full load without spilling.

The brand True Temper is stamped on each fork to mark it as the best tool of its kind that can be made.

THE AMERICAN FORK & HOE CO.
1901 Keith Bldg.,
Cleveland, O.

Makers of Farm and Garden Tools for over 100 Years

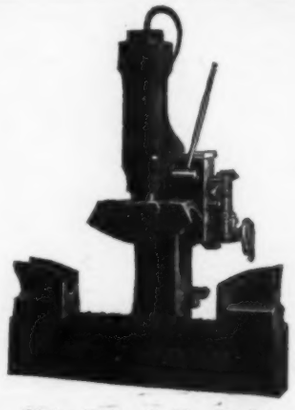
If your dealer has not yet stocked the Asphalt Fork, Cat. No. AF10, send us his name and $4.20 and we will supply you direct, postpaid.

Branded on the handle of every genuine TRUE TEMPER *tool*

ASPHALT FORK

Free on Request
Heavy Steel Goods or Industrial Tool Catalog. Describes over 50 tools for mill, mine, factory and coal yard.

TRUE TEMPER TOOLS



60 ton Hydraulic Pipe Bender

DO YOU BEND MUCH PIPE?

If you do you need a
Watson-Stillman
Hydraulic Pipe Bender

These machines are not only rapid and economical of labor, but the bends are made uniform and without danger of buckling or crushing.

We build pipe benders in a variety of types and sizes as well as a full line of Hydraulic Machinery including jacks, pumps, accumulators, presses, shears, etc.

Write for catalogs.

THE WATSON-STILLMAN CO.
1014 Evening Post Bldg., New Pork City

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Cleveland, Auditorium Garage Bldg.
Pittsburgh, Farmers' Bank Bldg.
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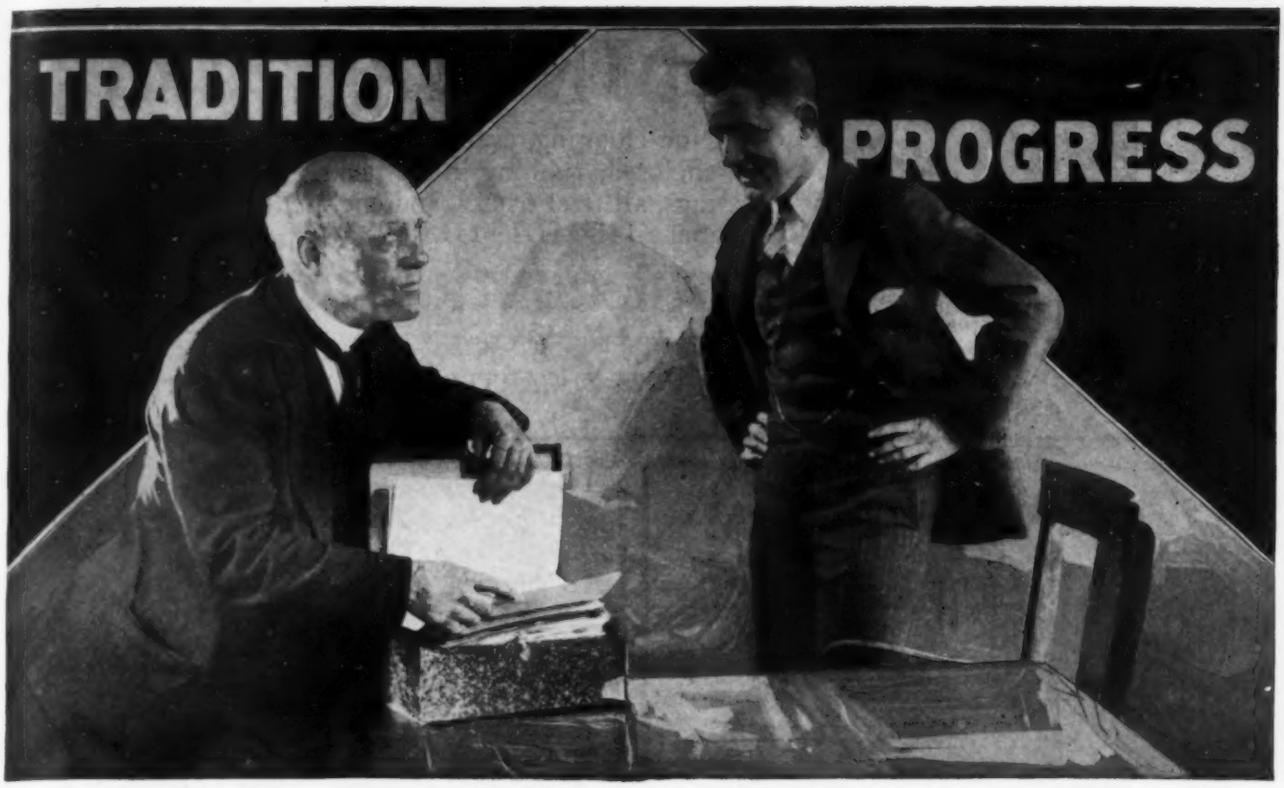
To make your unwatering and water supply problems easier!

THIS Morris Portable All-Purpose Pump handles anything from clear water to floating dirt, sand and gravel, delivers 300 to 600 gals. per min., can be used for heads up to 50 ft., and is easy to cart from one job to another. For general water supply, unwatering excavations, sumps, etc., it can't be beat.

Write for literature about this and other sizes of Morris Pumps

MORRIS MACHINE WORKS, Baldwinsville, N. Y.

MORRIS
CENTRIFUGAL PUMPS



"Here, Lad—

On that bid we're putting in for the steel erection—the architect will not let us attach bar joists by means of clips.

He insists on arc welding. Do you think the Lincoln machine is all set for this class of work?"

"Yes, Pop—

Not only all set but all hatched, too—and so is the practice of welding bar joists to floor beams.

In the 32-story Grant Building at Pittsburgh, this method was used to insure stronger and more rigid construction.

The bar joists used were specified by the architect. And architects and contractors who will come down to earth and investigate are bound to make the Lincoln 'Stable-Arc' welder part of their thinking from then on. They won't travel the old road again the old way — just as "Lindy" will never again visit Paris — alone."

The Lincoln "Stable-Arc" Welder

— welds easier
— makes better welds
— permits greater output

because of the steady uniform arc throughout entire welding range, which is the result of:

Variable voltage design
Laminated magnetic circuit
Separately-excited generator field
Double control of welding heat
All steel construction

No other welder has all these features.

The Lincoln Electric Co.,
Dept. No. 32-4, Cleveland, Ohio

W-83

"Stable-Arc" LINCOLN WELDER

HUMDINGER PUMPS

Non-clogging, everlasting rubber ball valves, totally enclosed, running-in-oil jacks, bronze bushed bearings, all steel trucks, and enclosed engine crank cases make HUMDINGER PUMPS.

THE CONTRACTOR'S CHOICE

Full detail description given in Bulletin No. 1034 CM. Send for a copy.

RALPH B. CARTER CO., 53 Park Place, New York

Factory: Hackensack, N. J.

Requires
Less Line Pull-
Costs
Less to Operate

A PLOW easily cuts dirt. Its shearing action minimizes the line pull and it requires less power. 4000 years have proved that this principle cannot be improved. . . . POWER PLOW SCRAPERS are essentially right and left hand plows. They alone offer all these plow advantages. They require less power to operate, have greater digging ability. In addition, they present less resistance against line of pull, eliminate hoist overstrain and prevent spilling of load. . . . These advantages of Power Plow Scrapers will cut your excavating costs. . . . Write for information.

THE GARST MANUFACTURING CO., 549 W. Randolph Street, Chicago, Ill.

Power PLOW Scraper

It is cheaper to lubricate wire rope than to replace it.

Millions of feet of wire rope are sacrificed each year on the altar of poor lubrication. Invariably this practice results in short rope-life, premature failures and frequent replacements.

Wire rope demands a special lubricant, one that prevents rust and corrosion, that clings to the steel wires and penetrates the strands, one that is impervious to water, and will not wash off nor drip.

Dixon's Graphite Waterproof Grease fulfills all these requirements. It is also the ideal lubricant for gears, and chains exposed to water and weather. It cannot gum or become rancid and will not squeeze out under heavy loads.

Insist upon its regular use. It will save many times its actual cost. Write for Circular 86-W

DIXON'S
WATERPROOF
GRAPHITE
GREASE

JOSEPH DIXON CRUCIBLE CO.
JERSEY CITY NEW JERSEY
Established 1827

Construction Methods, Tenth Ave. at 36th St., New York, N. Y.

ENCLOSED FIND ONE DOLLAR
ENTER MY 2-YEAR SUBSCRIPTION TO
CONSTRUCTION METHODS

Name .....

Address .....

City ..... State.....

Company Employed by or Business Connection....

.....

Nature of Business .....Title.....

For the man who borrows *your* copy of "Construction Methods"

We all know him. He doesn't mean to bother you. He really means it when he says he'll retutrn your copy.

But you know that, for some reason or other, he seldom does.

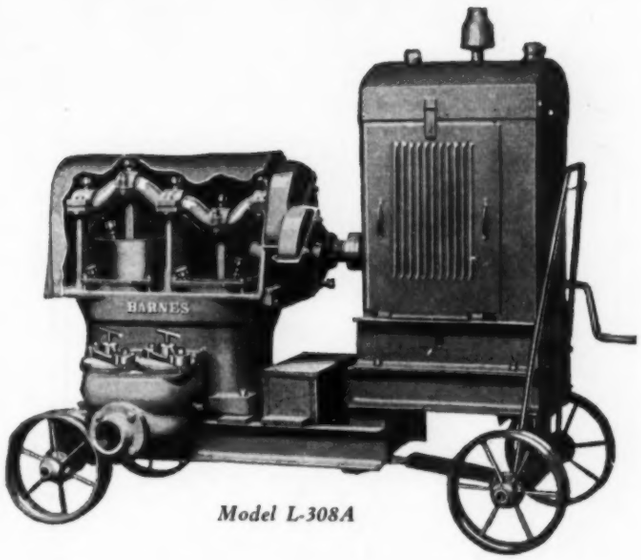
Give this man the coupon - - - , Tell him for $1, he can get his *own* copy each month for the next two years.

DEWATERING EXCAVATIONS IN SAND

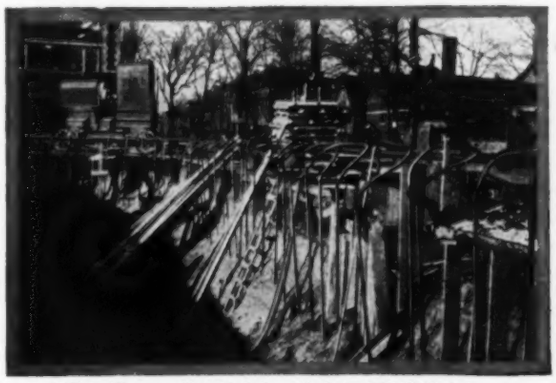
Simple design, sturdy construction, and the ability to render dependable service 24 hours a day, have made Barnes Plunger Trench Pumps the choice of experienced contractors.

Barnes Plunger Trench Pumps are powerful—they develop 25 to 26 inches vacuum and have a suction lift of from 25 to 28 feet. They are self-priming after being originally started. Large plunger displacement and high vacuum make these pumps especially efficient and practical for use on well point or sand drainage jobs. One Barnes Model L-308 A (illustrated above) steadily pumping day and night, handled 84 well points and kept the job completely drained.

Barnes Plunger Trench Pumps have many practical features that place them far above competition. Let us give you actual facts and figures about Barnes Pump Ability. Mail the coupon below for complete information.



Model L-308A



One Barnes L-308A handled 84 Well Points on this Job

THE BARNES MANUFACTURING COMPANY
923 Main Street, Mansfield, Ohio

BARNES PUMPS

Mail Coupon Today!

THE BARNES MANUFACTURING COMPANY
923 Main St., Mansfield, Ohio

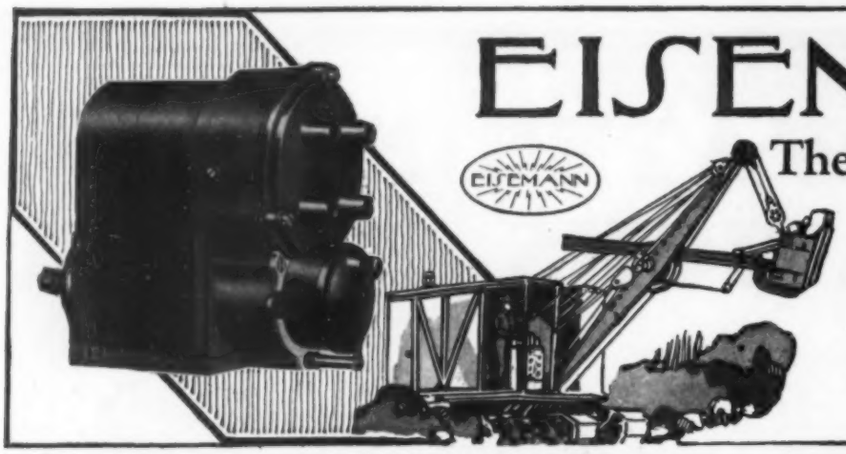
Gentlemen:
Please send me complete information about Barnes Pumps for dewatering excavations in sand.

Name .....

Address .....

City .....

State .....



EISEMANN

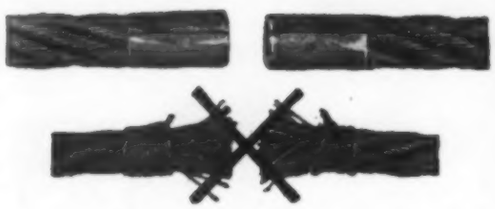
The Foremost Magneto

for Construction Equipment

The overwhelming choice of the builders of high quality equipment. Favored by contractors everywhere.

EISEMANN MAGNETO CORPORATION
165 Broadway - New York

The New Way To Cut Cable—



(1) One man whips and cuts any size up to 1" in less than a minute.

(2) Leaves cut ends incased in steel band—the ideal whip for passing through fixtures and fittings.

(3) Easily carried in kit (weight 8 lbs.) *

(4) No frayed ends—no cut hands—no delay.

* Larger Cutter for 1½ in. cable; weight 20 lbs

Starrett Steel Band and Cable Cutter
Write for Prices and Details

MORSE-STARRETT PRODUCTS CO.
1916 Broadway Oakland, California

"The only bucket we ever voluntarily recommended"

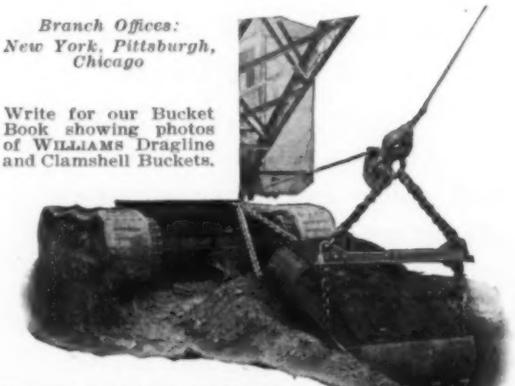
The WILLIAMS "Double-Arch" Dragline —the bucket that does NOT pull in at the sides— makes good for another New York contractor who writes:

"We have used many buckets, but never thought that any bucket merited a voluntary recommendation till we put this WILLIAMS Dragline to work." (Name on request.)

G. H. WILLIAMS COMPANY
607 Haybarger Lane, Erie, Pa.

Branch Offices:
New York, Pittsburgh, Chicago

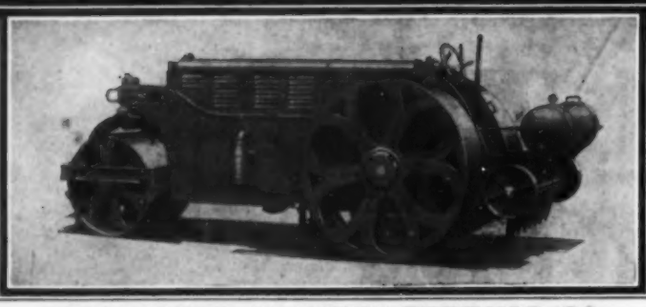
Write for our Bucket Book showing photos of WILLIAMS Dragline and Clamshell Buckets.



WILLIAMS
FAST-DIGGING BUCKETS

HUBER

4 CYLINDER MOTOR ROLLERS
POWERFUL AND DEPENDABLE
QUICK IN ACTION
ECONOMICAL TO OPERATE



MADE IN FOUR SIZES
5—7—10—12 TONS

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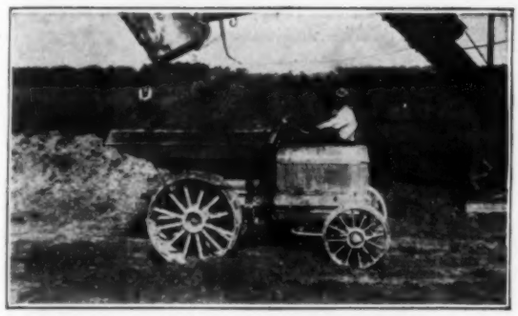
315 E. CENTER ST. **THE HUBER MANUFACTURING CO.** MARION, OHIO

More Profitable Than Trucks... MUCH



HERE'S a monster profit maker. A short haul dirt mover that will lick anything on 4 wheels or 4 legs. It will haul a huge load in places where trucks can't even go empty. It's almost impossible to stick it!

Look at it how you will, the "Iron Mule" is the most adaptable dirt mover ever offered to contractors. It's a complete tractor dump—a gravity dump body, mounted on the 10-20 McCormick-Deering Tractor which has specially designed, heavy duty French & Hecht wheels.

It's easy to handle—will travel a ploughed field as readily as a Macadam pavement, and a steep grade cannot check its go-ahead traction.

Dumping mechanism works positively—uphill or down—whether the unit is listing to right or left. "Iron Mules" can spot under shovels without waste of a second because driver is always facing load. He can run square up to fills without having to back up. The hefty body is designed for bulldozing. Trucks and wagons can't build their own road. "Iron Mules" can and do—as they go.

4 YARD

There are hundreds of "Iron Mules" in use. The State Highway Department of California has a fleet of 60. Even trucks have been discarded in preference to them by dozens of contractors.

Write for illustrated Broadside—know all about "Iron Mules," both the 4-yard with crawler tracks and the 2-yard. And if you want to see one in action, we'll tell you where. And you will, if bigger profits-per-load mean anything to you—if you want a dirt moving unit that makes trucks and teams look like liabilities on short hauls.

Ask about Hughes-Keenan dump truck bodies, too.

2 YARD

THE HUGHES-KEENAN COMPANY
MANSFIELD, OHIO

IRON MULE

TRADE MARK REG. U.S. PAT. OFF.

TRACTOR DUMP

MOUNTED ON McCORMICK-DEERING

DODGE BROTHERS TRUCKS

CHRYSLER MOTORS PRODUCT

Building each week more than a million dollars' worth of business builders

REPEAT orders . . . . . new orders . . . . . fleet orders . . . . . orders for single trucks . . . . . hundreds of them in a single day . . . . .

More than a million dollars' worth of Dodge Trucks are built and sold every week.

No testimonial could be more convincing than are the purchases of these keen buyers who are backing their sound truck judgment with their operating dollars.

They are buying what you want—power, speed, dependability, low operating costs, long life, high earnings. They buy business builders.

Let your Dodge Brothers Dealer show you the Dodge Truck that fits your needs exactly—body and chassis complete, ready to work.

Formerly Graham Brothers Trucks

The complete line of Trucks, Buses and Motor Coaches which Dodge Brothers have been manufacturing and selling under the name of Graham Brothers now take the name of their makers—Dodge Brothers.

These Trucks, Buses and Motor Coaches have always been powered by Dodge Brothers engines. For years they have been built of Dodge Brothers parts in Dodge Brothers plants according to Dodge Brothers standards.

These Trucks, Buses and Motor Coaches are sold, as they always have been sold, by Dodge Brothers Dealers everywhere.

PRICES

MERCHANTS EXPRESS—109" w.b.	$ 545
COMMERCIAL TRUCK—120" w.b.	775
1-TON—130" wheelbase	995
1-TON—140" wheelbase	1065
1½-TON—150" wheelbase	1345
1½-TON—165" wheelbase	1415
2-TON—150" wheelbase	1515
2-TON—165" wheelbase	1585
3-TON—135" wheelbase	1745
3-TON—165" wheelbase	1775
3-TON—185" wheelbase	1845

Chassis f. o. b. Detroit

SOLD BY DODGE BROTHERS DEALERS EVERYWHERE

Who's Getting the Big Contracts?

A Monthly Guide to Where the Construction Dollar is Being Spent

Middle West

Akron, O.
Exchange: Est. $700,000
W. J. Schirmer Co., 1720 Euclid Ave., Akron.
Aurora, Ill.
Theatre: Est. $500,000
Kaiser-Ducet Corp., Joliet, for Great States Theatre Corp., 162 North State St.
Canton, O.
Factory: $340,000
Robert Evans Co., Daily News Bldg., Canton, O.
Canton, O.
Tube Mill: $500,000
Warren-Hoffman Co., 312 3rd St. N. W. Canton, O.
Milwaukee, Wis.
Warehouse: Est. $200,000
H. Danischefsky, 1484 Humboldt Ave., Milwaukee, Wis.
Chicago, Ill.
Apartment: Est. $350,000
Capitol Cement Constr. Co., 3225 Fillmore Ave., Chicago, Ill. and others.
Chicago, Ill.
Apartment: Est. $1,000,000
L. Padorr & Sons, 155 North Clark St., Chicago, Ill. and others.
Chicago, Ill.
Apartment: Est. $500,000
Vagtborg Constr. Co., 251 West 79th St., Chicago, Ill.
Oak Park, Ill.
Apartment: Est. $750,000
C. A. Klooster, 111 West Washington St., Chicago, Ill. and others.
Chicago, Ill.
Exchange: Est. $2,000,000
R. F. Wilson & Co., 1851 Elston Ave., Chicago.
Lake Forest, Ill.
School: Est. $600,000
H. F. Friestadt & Co., 431 North Michigan Ave., Chicago.
Milwaukee, Wis.
Court House: $786,900
McClintic-Marshall Co., 38 South Dearborn St., Chicago, Ill.
Chicago, Ill.
High School: $913,800
Great Lakes Constr. Co., 306 South Wabash Ave., Chicago, Ill.

New England

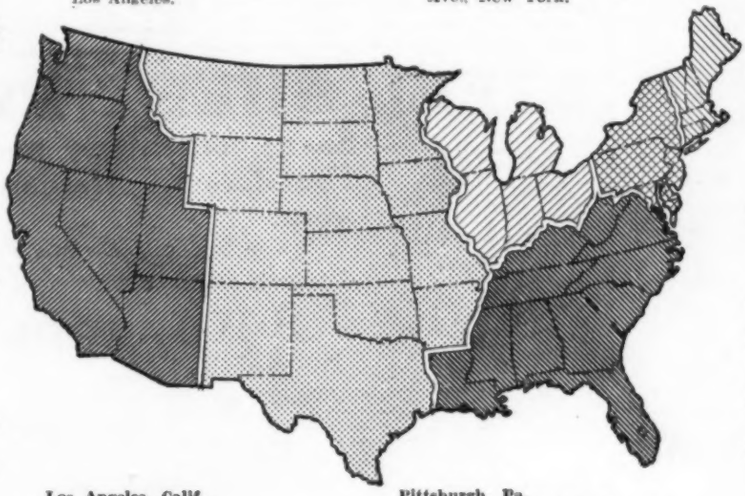
Milford, Conn.
Factory: Est. $300,000
W. J. Shaughnessay, Jr., Inc., 119 Fairfield St., Bridgeport
Stamford, Conn.
Garage, Showroom, etc.: Est. $125,000
T. J. Pardy Constr. Co., 1481 Seaview Ave., Bridgeport.
Cambridge, Mass.
Apartment: Est. $150,000
R. Allen, 1697 Cambridge St., Cambridge, Mass.
Providence, R. I.
Apartment: Est. $150,000
T. F. Cullinan, 1495 Broad St., Providence, R. I.
Boston, Mass.
Store and Office Bldg.: $150,000
W. and L. Eng. Co., 694 Washington St., Boston, Mass.
Quincy, Mass.
Market: Est. $500,000
A. Piotti Co., 708 Dudley St., Dorchester
South Boston, Mass.
Warehouse: Est. $150,000
Casper-Eanger Constr. Co., 129 Newbury St., Boston.
Hartford, Conn.
Business Bldg: Est. $175,000
W. Greenberg, 7 Westland St., Hartford, Conn.
Barnstable, Mass.
High School: Est. $175,000
W. J. Handley Co., Park Bldg., Main St., Fitchburg.
Manchester, Conn.
School: Est. $150,000
G. Schreiber and Sons, 285 West Center St., South Manchester.
New Haven, Conn.
Power Plant: Est. $1,000,000
Dwight Building Co., 69 Church St., New Haven.
Somerville, Mass.
Apartment: Est. $150,000-$160,000
E. R. Boyle, 8 Newbury St., Boston.
Boston, Mass.
Office: Est. $1,000,000
Thompson-Starrett Co., 250 Park Ave., New York.
Providence, R. I.
Hospital: $459,450
Hope Building Co., 36 Exchange Place, Providence, R. I.
Providence, R. I.
Bank and Office: Est. $500,000
O. D. Purington and Co., 605 Industrial Trust Bldg., Providence, R. I.

Far West

San Francisco, Cal.
Bridge: Est. $11,548,500
Siems, Helmers and Schaffner, Inc., 514 Guaranty Bldg., St. Paul, Minn.
San Diego, Calif.
Bridge: $3,500,000
McClintic-Marshall Co., Pacific Electric Bldg., Los Angeles.
Oakland, Calif.
Can Factory: $600,000
Scofield-Twaits Co., Hunter-Dulin Bldg., San Francisco.
Los Angeles, Calif.
Department Store: $750,000
McNeil Co., 5860 Avalon Blvd., Los Angeles
Los Angeles, Calif.
Theatre, Store and Office Bldg.: $1,000,000
Simpson Co., Architects Bldg., Los Angeles.

Middle Atlantic

Jackson Heights, N. Y.
Airport: Est. $10,000,000
Black & Bigelow, 551 Fifth Ave., New York.
Beacon, N. Y.
Carton and Printing Plant: $1,300,000
J. W. Cooper Constr. Co., Fidelity Bldg., Buffalo.
Pennsylvania
Paving: $549,990
Continental Constr. Co., Knickerbocker Bldg. Baltimore, Md. and others.
New York, N. Y.
Apartment: Est. $1,000,000
George A. Fuller Co., 949 Broadway, New York
Wilmington, Del.
Apartment: Est. $450,000
Taylor-Meyer Co., Keystone Bldg., Pittsburgh, Pa.
New York, N. Y.
Bank Vault, Stores, etc., Est. $3,300,000
Starrett Bros., 101 Park Ave., New York.
New York, N. Y.
Hotel: Est. $40,000,000
Thompson-Starrett, 250 Park Ave., New York.



Los Angeles, Calif.
Apartment: $750,000
Beller Constr. Co., 6513 Hollywood Blvd., Los Angeles, Calif.
Pittsburg, Calif.
Fish Cannery: $250,000
Lindgren and Swinerton, Inc., 225 Bush St., San Francisco.
Guma, Ariz.
Hotel: $1,000,000
Thomas A. Westgate Co., 914 Merritt Bldg., Los Angeles, Calif.
Beverly Hills, Calif.
Bank and Office: $500,000
P. T. Walker Co., 1111 West Garland Bldg., Los Angeles, Calif.
San Francisco, Calif.
Apartment: $700,000
Monson Bros., 475 6th St., San Francisco.
Wenatchee, Wash.
Hotel: $500,000
A. D. Belanger & Co., Everett.
Los Jolla, Calif.
Hotel: $600,000
T. A. Westgate Co., 914 Merritt Bldg., Los Angeles, Calif.
Emeryville, Calif.
Hotel and Store: $350,000
Jacobs and Pattiani, 337 17th St., Oakland.
Los Angeles, Calif.
Store: $500,000
Scofield Twaits Co., 1100 Pacific Finance Bldg., Los Angeles.
Oakland, Calif.
Office: $900,000
E. T. Leiter & Son, 811 37th St., Oakland

Pittsburgh, Pa.
County Office: $2,493,750
S. M. Siesel Co., Forbes Bldg., Pittsburgh, Pa.
Pittsburgh, Pa.
Store: Est. $1,000,000
Mellon Stuart Co., Oliver Bldg., Pittsburgh, Pa.
Brooklyn, N. Y.
Subway: $11,344,000
Carleton Co., Inc., 151 West 42nd St., New York.
New York, N. Y.
Manufacturing Loft: Est. $1,300,000
Magoba Constr. Co., 271 Madison Ave., New York.
New York, N. Y.
Bank and Office: Est. $1,250,000
Thompson-Starrett Co., 250 Park Ave., New York.
New York, N. Y.
Store, Bank and Office: Est. $1,250,000
Starrett Bros., 101 Park Ave., New York.
Pittsburgh, Pa.
Store: Est. $1,000,000
Irwin and Leighton, 1505 Race St., Philadelphia.
New York, N. Y.
High School: $1,819,000
Wilsaka Constr. Co., 355 East 149th St., New York.

South

Birmingham, Ala.
Court House: $2,331,750
Southern Terro Concrete Co., 70 Ellis St., N. E. Atlanta, Ga.

Huntington, W. Va.
Shops: $3,493,400
United Engineers & Constructors, Inc., 112 North Broad St., Philadelphia, Pa.
Russell, Ky.
Shops: $3,152,000
Hughes-Foulkrod, 471 7th Avenue, Pittsburgh, Pa.
Richmond, Va.
Office: Est. $900,000
McClintic-Marshall Co., Oliver Bldg., Pittsburgh, Pa.
Louisville, Ky.
Office and Hospital: Est. $2,000,000
G. A. Fuller Co., Flatiron Bldg., New York
Louisville, Ky.
Store: $400,000
B. W. Constr. Co., 720 Cass St., Chicago.
Bastrop, La.
Chemical Plant: Est. $350,000
Austin Co., 16112 Euclid Ave., Cleveland, O.
New Orleans, La.
Court House and Jail: $1,390,253
R. P. Farnsworth & Co., Maritime Bldg., New Orleans, La.
New Orleans, La.
Auditorium: $1,565,000
Caldwell Bros., 816 Howard Ave. and H. W. Bond & Bros., 1025 Capernicus St., New Orleans.
Texas
Streets and Roads: $1,663,265
C. H. McCellan, 1402 Travis St., Wichita Falls.
Florida
Streets and Roads: $327,035
L. M. Gray, Gainsville and others.
Durham, N. C.
Power Plant: Est. $350,000
Fiske-Carter Constr. Co., Greenville, S. C.

West of Miss.

Wichita, Kan.
Store: Est. $350,000
W. H. Bowen, 1404 Elm St., Dallas, Tex. and Havens Structural Steel Co., 1713 Crystal Ave., Kansas City, Mo.
Pine Bluff, Ark.
Bank and Office: $320,500
W. E. Peterson, Little Rock.
McAllester, Okla.
Temple: $495,000
J. H. Frederickson, Baltimore Bldg., Oklahoma City.
Duluth, Minn.
Bridge: Est: $448,100
Kansas City Bridge Co., 1012 Baltimore Ave., Kansas City, Mo.
Minneapolis, Minn.
Hotel: $1,500,000
Anderson and Nelson Constr. Co., 2801 Park Ave., Minneapolis.
St. Louis, Mo.
Bank and Office: Est. $1,500,000
Mississippi Valley Structural Steel Co., 4117 Big Bend Rd., Maplewood.
Beaumont, Tex.
Hospital: $433,300
Standard Constr. Co., Esperson Bldg., Houston.
Lubbock, Tex.
Hotel: $415,000
R. E. McKee, El Paso.
Tulsa, Okla.
Store: $500,000
J. R. Forner Constr. Co., Ritz Bldg., Tulsa, Okla.
Tulsa, Okla.
Store: Est. $300,000
Grimshaw Constr. Co., 402 Kennedy Bldg., Tulsa, Okla.
Minneapolis, Minn.
Hotel: Est. $2,000,000
Piper, Drake and Baker, 1138 Baker Bldg., Minneapolis.
Lincoln, Neb.
Store: Est. $250,000
Olson Constr. Co., 1120 Federal Trust Bldg., Lincoln, Neb.
Hutchinson, Kan.
Hotel: Est. $150,000
E. C. Clickner Constr. Co., Fair Bldg., Hutchinson Kan.
Texas
Oil Pipe Line: $150,000
Gulf Production Co., Gulf Bldg., Houston.
San Angelo, Tex.
Office and Store Bldg: $160,336
R. E. McKee, El Paso.

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FIRST-CLASS field engineer and construction foreman wants job; graduate civil engineer, four years' experience; now employed but desires change; excellent references; will go anywhere. Write Box 144, Clemson College, S. C.

GENERAL carpenter foreman wants position with responsible building firm; fifteen teen (15) years' experience; can handle any class of work. Hubert Crumbach, 7026 Quimby Avenue, Cleveland, Ohio.

CONTRACTORS who are in need of experienced men for their construction jobs can locate them quickly and economically by advertising in the employment columns of Construction Methods, which is read by 30,000 construction men. Advertising rate 10 cents a word. Address Searchlight Department, Tenth Ave. at 36th St., New York.

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Good condition. Will demonstrate. Price reasonable.

R. E. Brooks Co., 50 Church St., N. Y. C.

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Reconditioned, new paint. Will demonstrate. Worth the price.

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Erie B2 Steam Shovel

Caterpillar Type, rebuilt. May be seen working. Real buy.

R. E. Brooks Co., 50 Church St., N. Y. C.

Koehring ¾-Yd. Crane

Good operating condition. Price right.

R. E. Brooks Co., 50 Church St., N. Y. C.

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We can furnish equipment on rent, or sell for the smallest and largest construction projects.

Our list includes:

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BAR AND PIPE BENDERS
BOILERS
BUCKETS
CARS
CONCRETE MIXERS
CONCRETE PLACING EQUIPMENT
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HOISTS, Electric, Gasoline or Steam
Locomotives
MOTORS, Electric
PUMPS
SAWS
STEAM HAMMERS
STEAM SHOVELS
TRACTORS

Write for latest Stock List just off the press.

Equipment Corporation of America

656 Horn Bldg., 1601 Chestnut St., Philadelphia, Pa.
856 Empire Bldg., Pittsburgh, Pa.
1156 S. Washtenaw Ave., Chicago, Illinois.
Box 86 Conowingo, Maryland

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Bought, Sold, Rented.

WEMLINGER INC.

Service, Technical advice. Stocks on hand everywhere.

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INSLEY EXCAVATOR

Full Crawler, rebuilt. 60 days' guarantee. Price includes any new attachment installed.

R. E. Brooks Co., 50 Church St., N. Y. C.

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Saves you money and trouble in Foundation, Cofferdam, and Sewer work.

Bought-Sold-Rented—Always carried in stock

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31 South Clarke St. CHICAGO

BYERS BEARCAT

Just off job. Complete with crane, ditcher and skimmer attachments. Real buy.

R. E. Brooks Co., 50 Church St., N. Y. C.

27E REX PAVER

Full caterpillar type. Gasoline power. Boom and bucket. Recent model. Bargain.

R. E. Brooks Co., 50 Church St., N. Y., C.

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9-02

GREENSPON'S

ODEE Pipe for gas lines—factory-welded into double lengths, to cut field welding. Plain end and threaded pipe, with or without couplings. Casing in all sizes. *All ready for immediate Shipment from strategic centers.*

Jos. GREENSPON'S Sons
IRON & STEEL CO.
ST. LOUIS NEW YORK CITY
TULSA BORGER, TEX.
WHEATLAND, PA.

PIPE ·FOR ALL PURPOSES·

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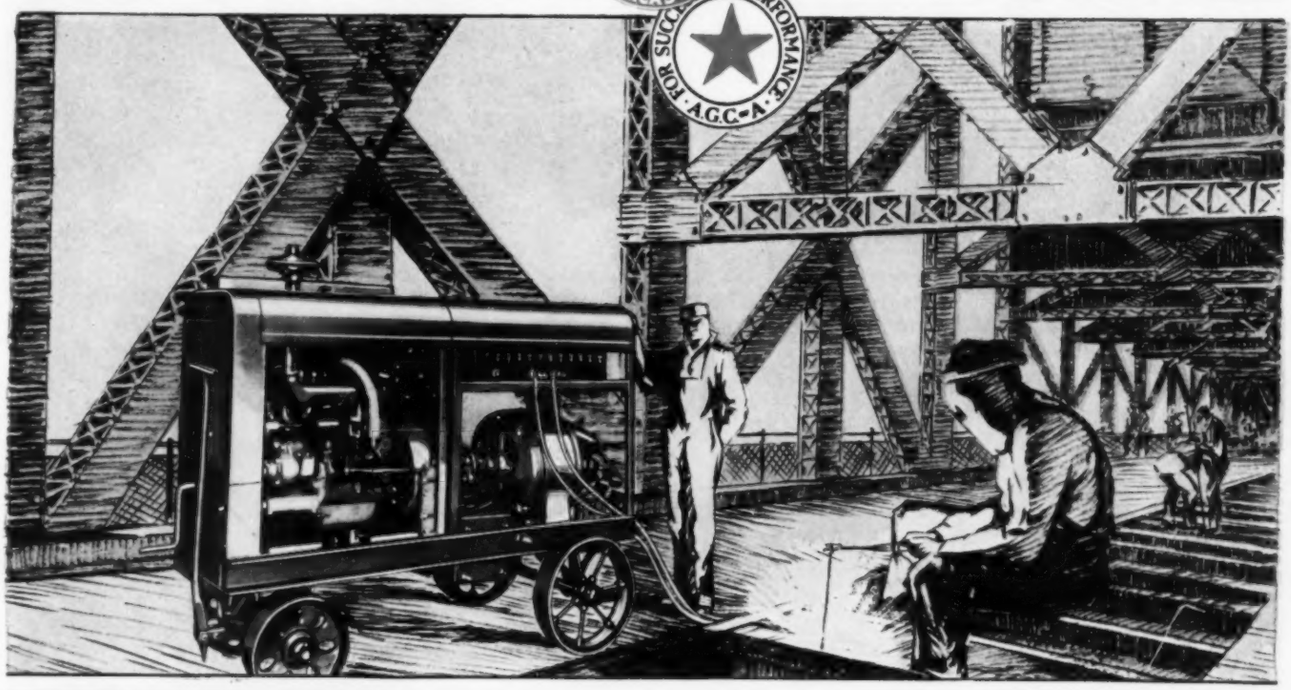

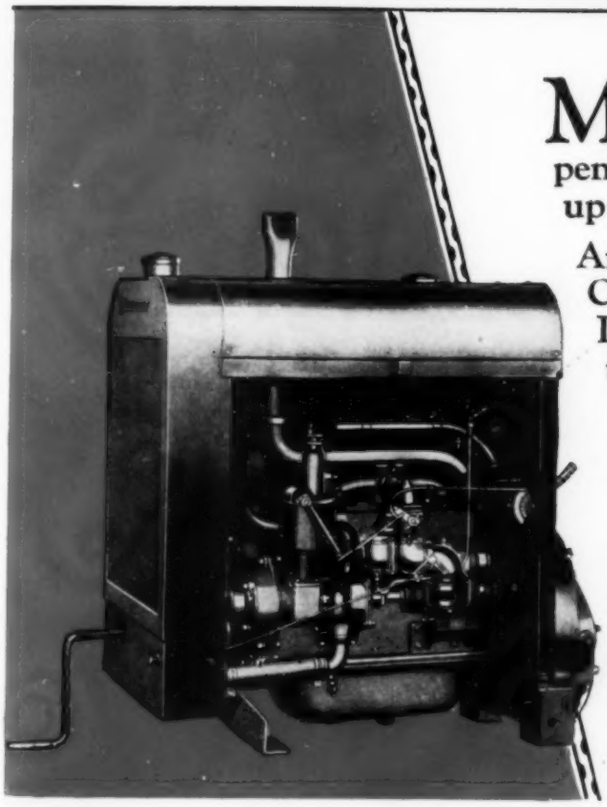

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